

# MODERN Machine Shop

HOWARD CAMPBELL, Editor

Volume 6

AUGUST, 1933

Number 3

## CONTENTS

	Page
INSPECTING CROSELY ELECTRIC REFRIGERATOR PARTS.....	7
By E. A. Austin	
"WE SELL SERVICE".....	14
By Wallace E. Watrous	
CHECK UP ON YOUR BELT DRIVES NOW!.....	20
By J. N. Smith	
MILLING MACHINE VISE JAWS FOR PRODUCTION WORK.....	22
By Adrian F. Mougey	
LAPPING PROCESS GENERATES PRECISION SURFACES.....	28
By Fred B. Jacobs	
IDEAS FROM READERS.....	34
—Improvised Setup for Cutting Bevel Gears, By John McCullagh	
—A Handy Grinding Fixture, By Avery E. Granville	
—Lap for Locomotive Exhaust Pipe Seats, By H. H. Henson	
—Combination Cutting and Forming Tool, By Charles H. Willey	
—A Clamping "Kink," By C. R. Diltz	
FORBES APPRENTICESHIP ARTICLE DEVELOPS INTEREST.....	38
(Letter from B. C. Forbes)	
"OVER THE EDITOR'S DESK".....	40
NEW SHOP EQUIPMENT.....	42
"INFORMATION WANTED," CHECKING PAGE.....	60
FOR YOUR CATALOG LIBRARY.....	62
INDEX TO ADVERTISEMENTS.....	64

Member

CCA

Over 25,000  
Circulation  
Covering  
More Than  
20,000  
Plants

Published monthly by Gardner Publications, Inc., 128 Opera Place, Cincinnati, Ohio

DON G. GARDNER, President and General Manager

JOHN M. KRINGS, National Advertising Manager

CHARLES G. ECKART  
Pacific Coast Manager  
San Francisco

GEORGE H. MEYERS  
Western Manager  
Chicago

GRANVILLE M. FILLMORE  
Eastern Manager  
New York City

(Copyright 1933 by Gardner Publications, Inc.)

# Reward!

## AND NO QUESTIONS ASKED

● The reward for using Alemite High Pressure Lubrication Systems AND Alemite Industrial Lubricants is a saving in maintenance cost, breakdown and repair bills of tremendous proportions. » » » The old-time grease-cup, oil-cup and oil-hole method of protection against friction has been proved the most costly relic of the early machine age. You cannot "lubricate" modern machinery under modern production speeds without modern methods. » » » The percentages saved in lubricants, lubrication time and breakdowns (due to faulty lubrication) saved by a complete Alemite-ing program are so great you must see them to believe them. Write today for test demonstration on your own equipment under any operating condition you care to specify. » » » NO OBLIGATION! WRITE AT ONCE!

ALEMITE CORPORATION (Division of Stewart-Warner)  
1882 Diversey Parkway, Chicago, Illinois.

Gentlemen: I am interested in information leading to reduction of costs through correct lubrication.

Name.....

Address.....

City..... State.....

PIONEERS IN SPECIALIZED LUBRICATION FOR INDUSTRY

CIN  
A C  
t  
atten  
of de  
the re  
of the  
gases  
be co  
der c  
machi  
assem  
and p  
which  
are m  
led in  
cess,  
dimen  
must  
the wo  
strum  
the s  
gaging

Fig. 1—  
h

# MODERN Machine Shop

AUGUST, 1933

CINCINNATI, OHIO

VOL. 6, No. 3

## Inspecting Crosley Electric Refrigerator Parts

By E. A. AUSTIN

Factory Manager, The Crosley Radio Corporation

ACCURACY is the keynote of electrical engineering — painstaking attention must be paid to thousands of details. The principle upon which the refrigerating unit operates is that of the compression and expansion of gases, and those gases can only be compressed and retained under compression by the use of machinery that is processed and assembled with the utmost care and precision. The limits to which refrigerator unit parts are machined are seldom equalled in any manufacturing process. Many of the limits on dimensions are so fine that care must be exercised to see that the work and the measuring instrument are of approximately the same temperature while gaging.

In selecting gaging equipment for the inspection of parts for the Crosley electric refrigerator, a special effort has been made to obtain gages and instruments with which the inspection could be made quickly, with which ab-



Fig. 1—Checking alignment of the shaft hole with the piston hole.

solutely accurate information could be obtained with the least amount of effort and motion, and which would be so designed that the human element would be eliminated. Only by the use of such equipment could a reasonable amount of speed in inspection be expected and positive information as to dimensions be obtained. Snap and plug gages have been discarded in favor of dial indicators, amplifying

square with the piston holes in the cylinder. The bearing holes have been diamond bored and bearinized, and the piston hole has been honed to a glass finish.

In order to make the inspection, the cylinder is slipped over a plug—upon which it is a push fit—that is attached to a base which also carries a standard for a dial gage. A shaft is inserted through the bearing holes—

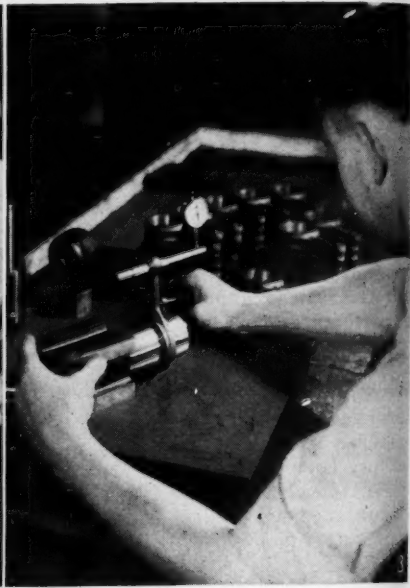


Fig. 2—Gaging the diameter of the piston hole after it has been honed. The Zeiss "Passimeter" indicates any variation in diameter or concentricity. Fig. 3—Checking alignment of the hole in the connecting rod.

gages, and comparators wherever possible, thus insuring that the same dimension will be obtained with a given instrument, regardless of any change of operators.

In Fig. 1 of the illustrations an inspector is shown gaging a crankcase for a Crosley refrigerating unit to determine whether or not the crankcase bearing holes have been machined at the correct distance from the top of the case, and whether they are exactly

also a push fit—and a reading is taken with the indicator at one end of the shaft. The case is then revolved on the plug and the opposite end of the shaft is indicated. The shaft is 10 in. long, and the variation in the readings of the indicator must not vary more than 0.002 in. At the same time the height of the shaft from the end of the cylinder is checked to make sure that it does not vary more than 0.005 in. from the drawing dimension, thus

Fig. 4—  
the sur-  
scratch

insurin  
compr  
obtain  
The  
finishe  
ment s  
of the  
of the  
in. for  
accura  
by the  
shown  
instru  
a varia  
of the  
of app  
the ga  
carries  
spaced  
tungst  
third i



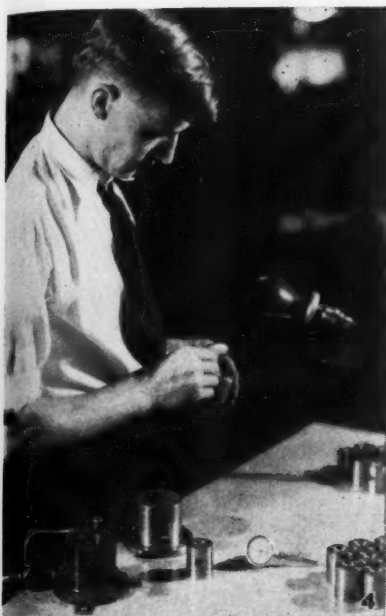


Fig. 4—Using a magnifying glass to examine the surface of a valve seat. The slightest scratch or minutest defect is cause for rejection.

insuring that the desired amount of compression in the cylinder will be obtained.

The piston hole in the cylinder is finished to size with the honing equipment shown in Fig. 2. The diameter of the hole is held within 0.0003 in. of the drawing size, and within 0.0001 in. for parallel and concentricity, the accuracy of the hole being determined by the use of a Zeiss "Passimeter", shown in use in the illustration. This instrument is of the amplifying type, a variation of 0.001 in. in the diameter of the hole registering over a space of approximately  $\frac{1}{16}$  in. on the face of the gage. The contact end of the gage carries three contact points, equally spaced, two of which are made of tungsten carbide and are solid. The third is the button which controls the

movement of the hand on the dial. Three contact points are sufficient so that, when the gage is revolved in the hole, any variation in diameter or concentricity is immediately registered.

The two important considerations in the finishing of the connecting rod are the diameters of the two holes, the spacing, and the alignment. Both of the holes in the rod are diamond bored and "bearinized"; that is, they are peened in the surface of the holes by the use of special equipment which was described on page 11 of the July issue of MODERN MACHINE SHOP: The diameters of the holes are held to within 0.0005 in. of drawing size; the dimension between hole centers must be within 0.001 in. of the specified distance, and the holes must be parallel with each other within



Fig. 5—Inspecting a flywheel for concentricity and parallelism of the belt groove.

0.002 in. in 5 inches. The twist must not amount to more than 0.002 in 5 in., also.

To check the above dimensions the hole in the large end of the rod is slipped over an arbor that is held horizontally as shown in Fig. 3, and an arbor is slipped through the hole in the small end. Using a dial gage that has previously been set by the aid of a special gage block, the dimension between hole centers, the parallel, and the amount of twist are easily determined.

The inspector shown in Fig. 4 is using a microscope to examine the seat in the end of the piston which governs the valve lift. The tolerance on the depth of this seat is 0.001 in., but the most important consideration

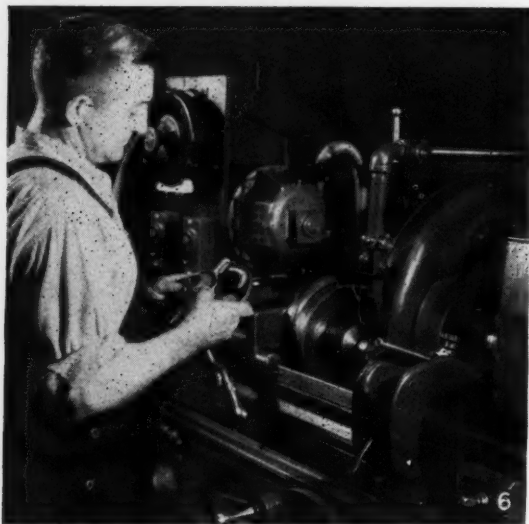


Fig. 6—An indicating micrometer or Zeiss "Passameter" is used to gage the diameter of the eccentric. The dial is graduated in ten-thousandths of an inch and the readings are amplified.

is that the seat must be 100 per cent free from imperfections of any kind, due to the fact that this seat forms a seal. The valve seat is carefully lap-



Fig. 7—Checking the alignment of the shaft hole with the surface of the eccentric.

ped to a flat, smooth surface by means of a power-driven oil stone. When finished, the valve wafer and keeper are

pressed into position and the valve seat is then subjected to air pressure, which is done by slipping the piston into one of the cylinders shown on the bench in the illustration, and turning a valve which allows air from the shop air-line to enter the cylinder. A drop of oil is smeared over the joint formed by the contact of the valve wafer with the edge of the seat, and if there is any leakage of air, bubbles will appear. The seat must be air-tight, else the piston is rejected.

The operation of inspecting a flywheel for the concentricity and parallelism of the belt groove is illustrated in Fig. 5. The crankshaft hole in the center of the wheel is slipped over the end of a shaft in a fixture which also carries a hardened disc that can be set down into the groove in the wheel. In fact, the fixture is made from a discarded cyl-

inder  
is wid  
sides  
way to  
with t  
is hel  
ner th  
confor  
groove  
that i  
A dial  
positio  
tacts  
any s  
disc is  
the dia  
The  
held i  
can m  
to any  
the gr  
so loca  
such  
operat  
by ha  
in the  
the gr  
dials.  
groove  
0.015 i  
0.010 i  
ation o  
chine i  
The  
the pis  
means  
a cran  
of an  
in the  
the co  
machin  
eccentr  
ret la  
special  
ed to n  
the co  
removin  
In the  
rod bea  
the plu  
6. The

inder and shaft. The face of the disc is wide enough so that it rests on the sides of the belt groove about half way to the bottom. The disc, together with the pin which serves as its axle, is held in a fork in such manner that it can move sidewise to conform to any curve in the groove, the pin being free so that it can slide in its bearings. A dial indicator is held in such position that the plunger contacts the end of the pin; thus any sidewise movement of the disc is immediately indicated on the dial.

The fork in which the disc is held is hinged so that the disc can move vertically to conform to any variation in the depth of the groove and an indicator is so located that it registers any such variation in depth. The operator revolves the flywheel by hand, noting any variation in the depth and straightness of the groove as indicated on the dials. To pass inspection, the groove must be parallel within 0.015 in. and concentric within 0.010 in., insuring smooth operation of the belt when the machine is in operation.

The reciprocating motion of the piston is obtained—not by means of an off-center throw on a crankshaft—but by the use of an eccentric which revolves in the hole in the large end of the connecting rod. The first machining operation on the eccentric is performed in a turret lathe, equipped with a special fixture and tools arranged to machine the shaft hole and the connecting rod bearing without removing the eccentric from the lathe. In the last operation, the connecting rod bearing is finished by grinding in the plunge-cut grinder shown in Fig. 6. The bearing must be round with-

in 0.0002 in., to size within 0.0005 in., and parallel with the shaft hole within 0.0003 in. in length of the bearing.

To insure that the limits on diameter have been maintained, the piece



illuminated scale. Fig. 9—Each piece is tested with the Schleroscope to determine its wearing qualities. Fig. 8—Perfection on small work is assured by the use of the Zeiss Projection Optometer. Any variation in the dimensions is amplified and indicated on an

is gaged with a Zeiss "Passameter" as shown in the illustration. The Passimeter dial is graduated in ten-thousandths of an inch, the graduations being amplified so that the readings can be taken easily. The paral-

lelism of the shaft hole with the periphery is determined by inserting a 10-in. shaft through the hole, placing the piece in a V-block, and testing the ends of the shaft with an indicator as shown in Fig. 7. The shaft must not vary more than 0.002 in. between ends, in either direction.

The drive shaft is machined all over, and must be practically perfect in every detail. In Fig. 8 an inspector is shown gaging the shaft for diameter and parallelism, using a Zeiss Projection Optometer which amplifies any variation in the diameter of the shaft and shows the diameter on an illuminated scale. The shaft must be straight from end to end within 0.0002 in. and round within 0.0001 in., both of which considerations are determined with the aid of the Optometer. The seal face, which is formed by the "step" between the diameters of the shaft, is ground and lapped to a perfectly flat seat, and is afterward examined with a microscope for flaws or imperfections.

### **Grant Rotary Vibrating Riveters and Grant Noiseless Rivet-Spinning Machines**

Bulletins have been issued by The Grant Mfg. & Machine Co., Bridgeport, Conn., describing the rotary vibrating riveters and noiseless rivet-spinning machines made by this firm. Each type of machine is especially adapted to its particular job and the jobs for which each is best fitted are discussed in the text. The bulletins contain full descriptions and illustrations of the machines, both the floor and bench types in the various sizes being shown. Copies gratis.

### **Type G High Speed Synchronous Motor Bulletin**

The Type G High Speed Synchronous Motors made by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., are fully described and illustrated in a bulletin that has been issued by this com-

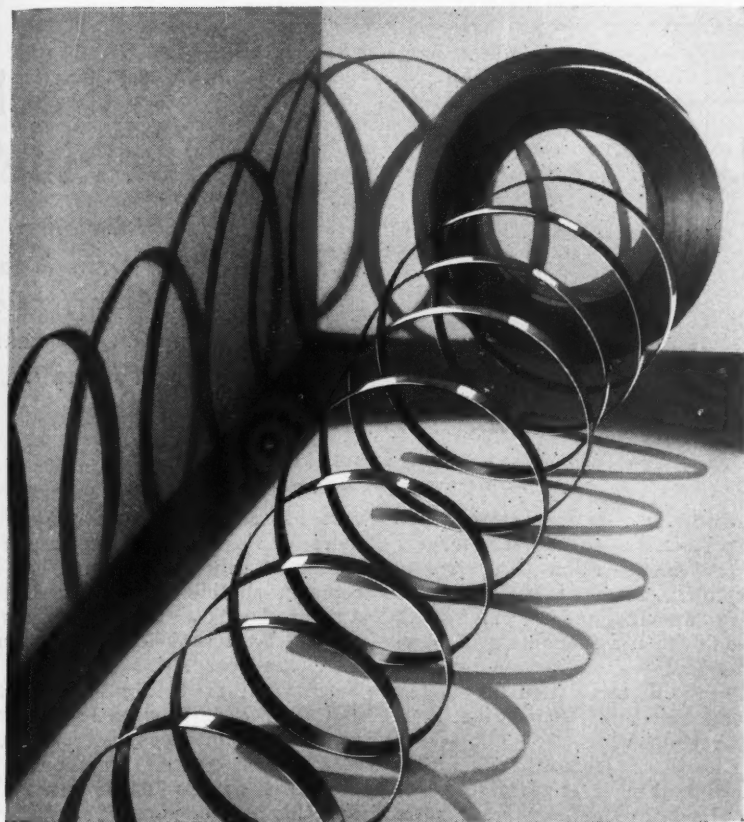
All shafts, pins, and other steel parts are heat treated to impart to them the wearing qualities most desirable for the work to be done. Each part has its own treatment, and each treatment produces a given hardness. To make sure the treatment is correct, each piece is tested with a Schleroscope as shown in Fig. 9. The hardness of the piece is reflected in its resiliency, which is indicated by the hand on the dial.

The care and precision with which the parts that enter into the making of a Crosley refrigerating unit are machined and inspected would indicate their interchangeability. The unit is not assembled on this basis, however; all parts are selected and mated in the assembly. Each part must be a perfect fit with the parts to which it is assembled, and when a unit has been completed and has passed the final inspection, it is never repaired. In case of trouble in service, the unit is replaced complete, and the troublesome unit is returned to the factory to be torn down.

pany. These motors, with thermoguard protection, are recommended for all types of constant speed machinery such as fans, blowers, compressors, pumps, Jordans, beaters, rubber mill lines, and so on. Copies may be had by addressing the firm as above.

### **Splash and Drip Proof Drives**

A four page leaflet describing a new complete line of splash and drip proof motors and control for every machine requirement has recently been issued by the Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa. This complete line of equipment is especially suited to the requirements of machines where splashing occurs. Splash and drip protected, this equipment is ideal for use in dairies, meat packing plants, canneries, breweries, paper mills, boiler rooms, coal yards, sand and gravel plants, wet grinding processes and wherever water should be guarded against for the most dependable and economical operation of electrical equipment. Copies free upon request.



## Why import high carbon flats?

IF YOU COULD see the fine spring steel we are turning out you would understand why many users who formerly imported this wire now buy it from Roebling.

We can meet most exacting requirements because:—(1) we *specialize* in high quality flats; (2) we have over 40 years experience; (3) we are organized to give this business the painstaking care it demands.

Investigate our quality and service. Roebling cold rolled high carbon steel flat wire is made tempered or untempered, in any finish. We are also ideally equipped to make cold rolled low carbon flats and strip steel.

JOHN A. ROEBLING'S SONS COMPANY  
WIRE WIRE ROPE WELDING WIRE COPPER AND  
INSULATED WIRES & CABLES WIRE CLOTH & WIRE NETTING  
TRENTON, N. J. Branches in Principal Cities  
Export Dept.—New York, N. Y.



# ROEBLING FLAT WIRE



## "We Sell Service"

*How the firm of Peter Gray & Sons fills orders for sheet metal specialties and stampings.*

BY WALLACE E. WATROUS, Superintendent,  
as told to Francis A. Westbrook

**S**UCCESS in the jobbing machine shop business depends very largely upon one consideration — service to the customer. Service is the job shop's major commodity and its chief stock in trade. Upon a foundation of service the business of Peter Gray and Sons was built more than fifty years ago and upon this foundation it is still carrying on.

The type of jobbing business in which this firm is engaged can not be obtained through any other form of advertising than the references of satisfied customers. Our firm has had the customer's good will as the object of achievement for more than half a century, and it has guided us in matters of quality, performance, and price. At the same time it has been necessary to operate at a reasonable profit; thus we have had to give careful consideration to several factors which, experience has taught us, cannot be overlooked.

**PRICE.** In arriving at the price of a product, the cost of any special tools required for the job must be taken into account. In the case of an order involving large production, the

cost of tools is usually disregarded more or less because such cost is spread so thin that the unit cost becomes negligible. However, we make a point of making the best tools practicable, because delays due to faulty tools can cost a lot of money. In cases where production is to be small and where, consequently the tool charge per unit is considerable, there is a distinct reason for keeping the tool cost as low as is practicable. For this reason a hand operation is, in many cases, justifiable.

The material expense is the second item of cost, and is generally fixed unless consultation with the customer brings out the fact that a cheaper type of material may be used. In this connection the finish may sometimes be varied to reduce the price.

Cost of manufacture depends upon the quality and quantity of tools required to be made, as well as the size of the work-pieces. The size of the parts is a determining factor in the expense of handling. The shape of the part also determines the number of press and other operations.

**DELIVERY.** The delivery of the

lot i  
secu  
of i  
tome  
the  
time  
ing  
Some  
tain  
sary  
parts  
sourc  
meet  
of  
sched  
The  
m sul  
impor  
tomer  
reaso  
small  
mean  
large  
ductio  
stand  
press  
produ  
parts  
matte  
thousa  
can be  
the r  
tools  
up, bu  
operat  
sive,  
times  
DES  
that n  
we kn  
of us,  
be met  
drawing  
the cor  
the m  
plain t  
unit t  
sketch  
are ma  
idea o

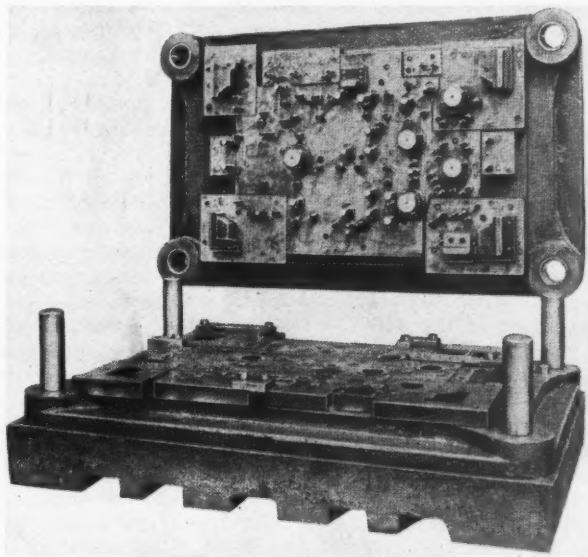


lot is often a matter upon which the securing of an order depends, because of its great importance to the customer. It may be necessary to get the unit on the market at a given time in order to fit in with advertising schedules or sales campaigns. Sometimes we manufacture only certain parts of a unit, making it necessary to synchronize the delivery of parts from several sources in order to meet the requirements of the customer's schedules.

The rate of delivery on subsequent parts is important to the customer for the same reasons; delay on one small part might mean holding up a large volume of production. From the standpoint of actual press operation, the production of the parts may be only a matter of hours, for thousands of pieces can be produced when the machines and tools have been set up, but delay between operations is expensive, although sometimes hard to avoid.

**DESIGN.** In order to make sure that no misunderstanding exists, that we know what the customer expects of us, and that his expectations can be met, we very carefully go over his drawings with him before we take the contract. If the customer leaves the matter of design to us, we explain the design and operation of the unit to him by means of rough sketches before complete drawings are made, so that he will have a clear idea of the cost. If the customer

furnishes the drawings, we make sure that his design is practicable and that we understand clearly what he wants. In all cases we work as closely as possible with the client during the preliminary stages in order to obviate, as far as practicable, all possibility of trouble later on. For example, when the design is complete we first make sure that the unit will



One of the dies turned out by the Peter Gray & Sons shop.

work as intended and, second, that the manner in which it is laid out will permit of the cheapest method of manufacture.

In cases where changes are to be made, we bear in mind that such changes should be primarily for the purpose of simplifying the design of the tools and thus reducing the cost of the finished parts. Changes may also be made for the purpose of improving the appearance or operation of the part, but whatever the



changes may be and whatever their purpose, we are careful to make sure that they will be satisfactory, because if they are not, we will be held responsible. We are very likely to be held responsible anyway, if any part of the job proves unsatisfactory, so our obligation to give our customers the benefit of our experience is always present.

Among the changes which we frequently recommend are changes in the shape of one or more parts for the purpose of simplifying the tools or to reduce the number of manufacturing operations, and we sometimes suggest changes in the material. A cheaper material may be just as suitable, or the stresses to which the material selected is to be subjected may be too great. The question of finish is also important, as it may have a considerable bearing on the cost or upon the service that will be expected of the unit.

Occasionally we consider it advisable to make samples, usually by hand, to convince the customer that the design is correct or that we can produce the unit satisfactorily. The making of samples also provides an advantage in that ideas often result for the improvement of the product or for reducing the cost.

**ESTIMATING.** When the product has finally been approved, the sample or drawings are given to the estimating department, where an estimate of the cost of production is made so that a price can be quoted. At this time the material requirements are decided on and the information is given to the purchasing department, which obtains prices and possible delivery dates. In the estimate, the prices of the tools and the parts are given separately.

We always try to impress upon the customer the importance of an early order for the tools, so as to avoid rush work. Rush work on toolmaking is

usually costly. If the order for the parts can be obtained at the same time, the material can be ordered so that it will be on hand when the tools are completed.

When the tools are ready, they are set and samples are produced to make sure that everything is all right. This is very necessary, as it may be found that the temper of the material is wrong for the job and an entirely new lot of material must be ordered. To avoid delays due to such contingencies, we make it a general practice, when purchasing steel for a difficult draw or form, to show the steel salesman either drawings or samples of the job so that he will know what his steel will be required to do. Even with these precautions, the steel may fail in the later operations, necessitating an annealing operation between press operations.

When samples which are representative of actual production are ready, a set is submitted to the customer for his approval. When such approval is obtained, and not before, we consider that we are ready to go ahead with the job.

On some of the minor parts and operations where prints have been approved by the customer, our checking with these prints is considered as approval to proceed with the job. In some cases our checking of samples to previous samples is considered as approval.

**PRODUCTION.** The first run is very important. As regards the cost of operations, it is a fact that as we begin to get into the swing of the work, the cost begins to decline toward some minimum point which can only be determined by reaching it. Many variables enter into the situation, including the days of the week, the weather, and even the home life of the operator on the job. We have

**90% of the Automobile Shops**

**Now Use the Modern**

# **"SELF-OPENING" STUD SETTER**

**Why? - Because It Is  
Speedy and Accurate**



The "MODERN" STUD SETTER has speed—its action is instantaneous—it is accurate—that's why most of the automobile plants find them the most economical to use for production work.

The MODERN STUD SETTER is used on electrical or air driven tools, or in drill presses. Made in two sizes to take up to  $\frac{1}{2}$ " or  $\frac{3}{4}$ " studs. Also made in a heavy duty size special for rapidly setting larger studs of coarse lead up to 2" diameter. Write for a bulletin and tell us the size studs you use. Full information will be sent promptly.

## **OTHER "MODERN" PRODUCTS**

Self Opening Die Heads (Stationary Type)  
Self Opening Die Heads (Revolving Type)  
Solid Adjustable Die Heads  
Adjustable Hollow Milling Tools  
"Modern Magic" Quick Change Chucks and Collets  
Collapsible Taps  
Friction Tap Collets  
Tapping Attachments  
Threading Machines  
Chaser Grinding Machines  
Inserted Blade Face Milling Cutters

*Send for Catalogs*

# **MODERN TOOL WORKS**

**ROCHESTER, N. Y., U. S. A.**

Division of Consolidated Machine Tool Corporation of America

learned from experience that a sort of "production sense" is required, to know when this minimum has actually been reached, and that the possession of this production sense distinguishes the real production man from the theoretical one.

The first run should be as small as is consistent with the price, everything considered. It provides an opportunity to "shake down" the tools; that is, make minor changes of setting which will be advantageous. In some cases it will be found that a minor change in the method of gauging the feed of the stock will speed up production. Sometimes the press feeds can be increased or slowed down, the latter to eliminate breakage in drawings or to prevent poor forming due to the whip of the stock in some of the forming operations where long ends are hauled up with short punches.

Tilting of the press will often make the removal of slugs or parts from the press either wholly or partially automatic. Compressed air operated with a whistle valve operated by the stroke of the press may be made, sometimes, to accomplish what otherwise might be a slow or hazardous operation. In drawing operations, a study of lubricating compounds will frequently aid in the selection of a compound that will greatly simplify subsequent cleaning and thus avoid the use of a special cleaning solution. Of course it is of advantage to confine this "shaking down" to as small a run as possible.

**MANUFACTURING.** It is very desirable, if at all possible, to set up all the operations on a job so that actual production on all operations can be obtained before the job has progressed very far. It is evident that on a multiple operation a lot of trouble and expense could be saved if,

say on the fourth operation, it were found that the stock was failing, and this could be discovered before much of the stock had been used up on the three previous operations. One might say that this condition should have been discovered in the making of the samples, which would have been true if the steel mills could control to a fine degree the rolling of the stock, but it is impossible for them to do it.

There is another element to be considered, and that is that in most cases the samples are made with the tools in a screw press instead of an actual power press, which means that the pressure is applied slowly in the making of the samples, whereas in the power press the ram strikes more of a hammer-like blow. Fortunately there is generally some way to get around press operation troubles, but sometimes it is costly.

We feel that it is generally good practice to produce an over-run as the actual cost of labor and material for a few excess parts is a very minor consideration in comparison to the cost of resetting the tools in case of a shortage. An over-run on the presses will also take care of the spoilage in subsequent operations, and as the material is usually special and is over-shipped, it might as well be worked up. In addition, it would only take up valuable stockroom space if not used. I cannot stress too strongly the importance of running at least full count on press operations. A shortage on one small piece worth a few cents might hold up machinery worth many hundreds of dollars.

**INSPECTION.** Inspection in any line is a large subject, but for our purpose I shall mention it here only casually. The type of inspection required depends primarily upon three considerations; the product, the customer's requirements, and the length of the run or the quantity to be pro-

duce some rigid wise customer In so his o very

The bearing because comes able to by him were tice to fiftiet means that o the er hundr

FIN article three o shape service Some have t

Co Coun

The poration sion, 12 igan, ha ering tl counter spotface the vari and taj holders, made fo tools are sisting are also is a sec tools, wi handled The c taches i

duced. It is easily understood that some products require a much more rigid inspection than others; likewise it is easy to realize that some customers require much closer inspection than others on similar products. In some cases the customer supplies his own inspector, which we consider very desirable.

The quantity to be produced has a bearing on the matter of inspection because on long runs the operator becomes familiar with the part and is able to catch errors which would get by him if his contact with the job were shorter. It is our general practice to have the operator check each fiftieth or hundredth piece, which means that the maximum of pieces that could possibly be wrong before the error was caught would be one hundred.

**FINISH.** The finish applied to an article depends, as a rule, upon one of three considerations; the material and shape of the piece, the conditions of service, and the customer's ideas. Some parts permit of dipping, others have to be sprayed, and still others

need brushing. Sometimes a combination of these methods is necessary.

As regards conditions of service, the finish must be carefully considered. Where the unit is to be used out-of-doors, a rust-proofing process should be applied even though color is applied afterward for the sake of appearance. In lieu of rust-proofing, a good grade of baking oil primer may be used, as it will permit of either a baking enamel or air-drier lacquer on top. In many cases we use a plating of copper, nickel, either polished or dull, chromium, which is usually polished, or one of the various forms of cadmium.

**Shipping.** We consider the shipping of finished products a very important matter. It should be plain that any article that is poorly packed for shipment is an engraved invitation for the loss of both money and good-will. If the packing has been carefully and intelligently done, it creates a good impression for the packer, and when for some reason the article is damaged in shipment, the matter is looked upon with understanding.

Copies may be had upon request by any mechanical executive.

### Continental Interchangeable Counterbore Catalog No. CT-233

The Ex-Cell-O Aircraft & Tool Corporation, Continental Tool Works Division, 1220 Oakman Blvd., Detroit, Michigan, has issued Catalog No. CT-233, covering the complete line of counterbores, counterbore cutters, countersinks and spotfacers made by this company. All the various kinds and types of straight and taper shank holders, stop collar holders, and adjustable length holders made for use with the above-mentioned tools are included. Counterbore sets consisting of standard holders and cutters are also shown in the catalog, and there is a section devoted to special-operation tools, which indicates the range of work handled by this type of tool.

The catalog contains 32 pages 8½x11 inches in size and is fully illustrated.

### Westinghouse Thermoguard Motors

An illustrated circular giving complete information on Westinghouse Thermoguard motors and their applications has recently been issued by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. These radically new self-protected motors may be used on all applications with the assurance of full protection under all conditions of operation, however extreme. Should the motor windings become dangerously overheated, the motor may be so connected to give a warning signal or to be disconnected from the line. Copies of the publication may be obtained from the advertising department of the Westinghouse Company at the above address.

# Check Up On Your Belt Drives

*As manufacturing operations are resumed and an increasing amount of equipment is placed in service, difficulties resulting from "going off half-cocked" can be avoided by making sure that the drives are in good shape beforehand.*

## Now!

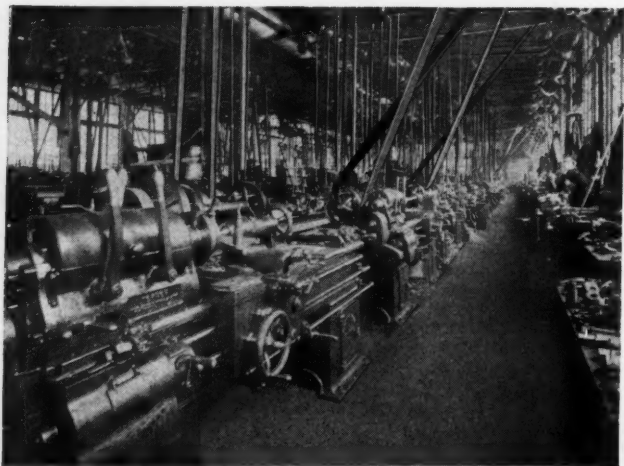
By J. N. SMITH

Engineering Department, E. S. Houghton & Co.

**D**URING the past two years many plants have fallen into the habit of "robbing Peter to pay Paul" in order to keep machines running at a minimum of expense. Belting has been removed from equipment that had been shut down, for use on other equipment where belts were needed. As a result, when the superintendent receives orders to start production on the machines that have been shut down, he frequently finds that the

belts are missing and the machine cannot be operated.

This practice is quite common and, necessity for economy considered, cannot be condemned. The trouble is that the attitude of the average shop man toward the belt is wrong; belting is rarely given the consideration that it should have, and a great deal of money is wasted directly or indirectly through failure to appreciate the necessity for correct sizes, through



▲

A good example of a group drive arrangement in a modern, well-lighted plant. Full value for the money invested in these high grade machines is dependent upon—and guaranteed by—the proper care and maintenance of the power transmission equipment.

▼

If a k  
mineral  
soaking  
chloride  
necessary  
however,  
tion not  
eral oil,  
the leath  
sary to  
leather;  
comes ha  
tion it v  
on the pu  
turally.

misus  
ice, an  
while  
The  
in wh  
standi  
fore t  
service  
spectec  
ditione  
more r  
regular  
are ma  
can be  
that ha  
need a  
to put  
are a f  
checked  
duty:

1. A
2. A
3. Is
4. Is
5. A
6. A
7. A
- me

misuse of the belt while it is in service, and through lack of proper care while it is out of service.

There are undoubtedly many plants in which dozens of belts have been standing idle for many months. Before these belts are put back into service, they should be carefully inspected and—where necessary—reconditioned. Belting often deteriorates more rapidly while idle than when in regular use, in addition to which there are many ways in which an idle belt can be damaged. Invariably, a belt that has stood idle for some time will need a certain amount of attention to put it in first-class condition. Here are a few of the items that should be checked before a belt is returned to duty:

1. Are there any broken or badly-damaged spots in the belt?
2. Are there any open laps?
3. Is the belt saturated with oil, or covered with dirt?
4. Is the belt of the correct length for its drive?
5. Are the laces or fasteners badly worn or broken?
6. Are there any points sticking up on metal fasteners to constitute a safety menace?
7. Are the pulleys over which the belt is to run in correct alignment?

If a belt has become soaked with mineral oil, it should be degreased by soaking in gasoline or carbon tetrachloride for 24 hours—or longer if necessary. It must be remembered, however, that the degreasing operation not only removes all of the mineral oil, but also the natural oil of the leather. The natural oil is necessary to lubricate the fibers of the leather; without it the belt soon becomes hard and dry, in which condition it will lose its elasticity, slip on the pulleys, and wear out prematurely. Therefore, after a belt has

been thoroughly degreased, it should be dressed with a good belt lubricant to preserve the leather and insure good service from the belt.

Sticky belt dressings should never be used. Such dressings serve temporarily to make the belt adhere to the pulleys, but they contain little or no actual fibre lubricant. If a dressing composed of ingredients that will properly lubricate the fibres of the leather is used, it will not be necessary to resort to the use of "sticky" dressings.

No foreign matter such as dirt, metal particles, wood chips, or adhesive material of any kind should be allowed to accumulate on the belting or on the face of the pulleys. The belt should be cleaned by scraping with a dull-edged scraper; a sharp scraper should not be used until the laps have been re-cemented. If it is found necessary to re-cement a lap, all of the old cement should be scraped off first. Then the laps should be thoroughly roughened, either with coarse emery cloth, a rasp, or a wire brush, so as to raise the fiber of the leather and permit the cement to be worked in.

A belt that has been left for some time on an idle drive has, no doubt, become permanently stretched. Therefore it will be wise to remove the belt from the drive and shorten it to the proper length so that the correct tension will be obtained. This should not be done, however, unless the belt is to be put into service.

Fasteners and laces should be carefully inspected, and those that are broken or worn should be replaced immediately. A worn lace or fastener is liable to "let go" at any time—possibly with disastrous results. Even though it may not allow the joint to separate entirely, a broken fastener will not only cause the belt to run

(Continued on Page 26)



# Milling Machine Vise Jaws for Production Work

BY ADRIAN F. MOUGEY

**A**LTHOUGH the use of the vise in production milling is common practice, there is still a great deal of time lost and a vast amount of material wasted through failure to appreciate the necessity for proper design of vise jaws. Several designs of vise jaws, together with set-ups, are shown here and although the job in hand may be different from any of those illustrated, it is likely that some

one of these designs can be adapted with satisfactory results.

To begin with, wherever possible a good commercial production milling vise such as those manufactured by Pratt & Whitney, Garvin, Brown & Sharpe, or the Chicago Tool & Engineering Company should be used. The vise should be built as close to the base as possible, and a vise without a swivel should be used so as to

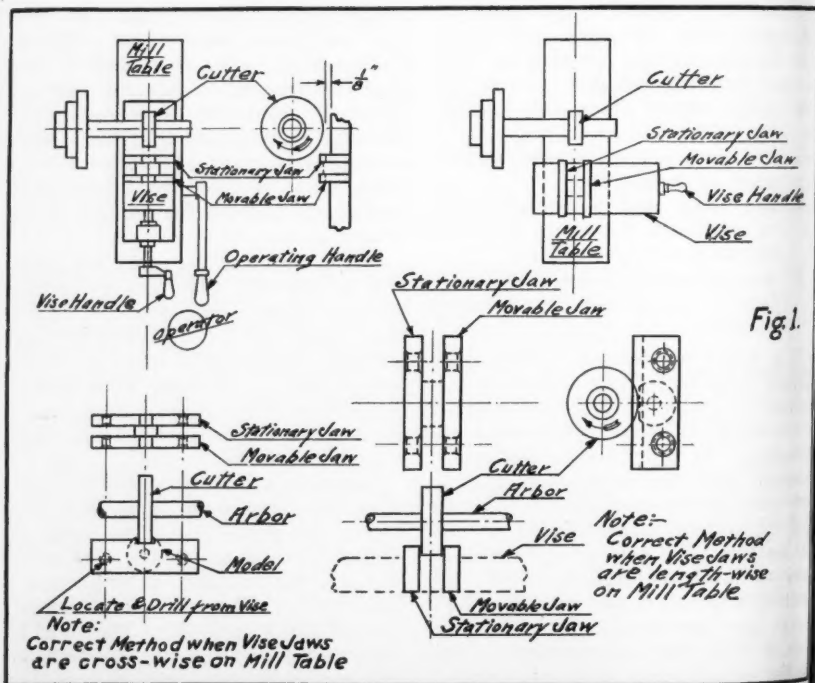
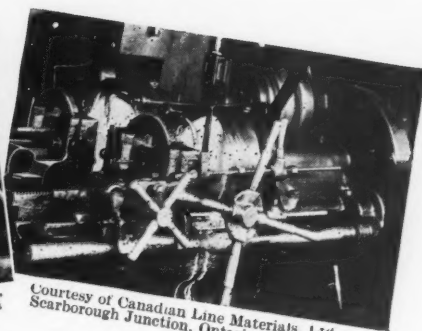


Fig. 1—Layout showing correct method of setting up vise.





Courtesy of Canadian Acme Screw & Gear, Ltd.,  
Toronto, Ontario, Canada



Courtesy of Canadian Line Materials, Ltd.,  
Scarborough Junction, Ontario, Canada

**Operation:** Hobbing Rough Cut on Drive Pinions.

**Machine:** Barber-Colman Gear Hobber.

**Material:** Upset Forging S.A.E. 6150.

**Length and Depth of Cut:** 1.5 inch long and .255 inch deep.

**Production:** 12 Pieces Per Hour.

**Lubricant:** 1 Part Sunoco to 6 Parts Water.

**Operation:** Threading 2½ inches on One End of ¾ inch Rod Steel, and 2 Heads on High Cone.

**Machine:** Landis Double-Head Threading Machine.

**Material:** Bolt Steel, .25 Carbon.

**Production:** 200 Pieces Per Hour.

**Lubricant:** 1 Part Sunoco to 10 Parts Water.

## PROFITS are made...or lost... at the point of the cutting tool

**I**n your efforts to secure operating economies and efficiency (with consequent better profits) don't overlook the far-reaching importance of your cutting lubricant.

Increased machine speed, longer runs per tool grind, less lost time for resetting, reduced tool maintenance, greater accuracy and better finish—all lead to greater profits—and all are made possible with Sunoco Emulsifying Cutting Oil.

In addition, SUNOCO protects the finished work from rust and corrosion. It will not separate, and is hygienic; does not become rancid after prolonged use.

*We cordially invite your correspondence and offer the services of our experienced Cutting Oil Engineers.*

**Sun Oil Co., Philadelphia, Pa.**

Offices and Warehouses in more than 100 Cities.

# SUNOCO

## EMULSIFYING CUTTING OIL

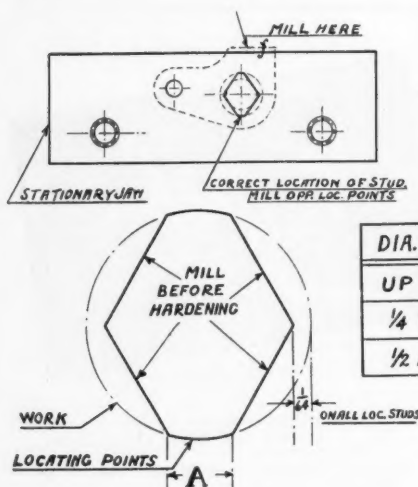
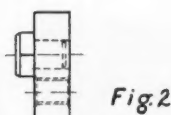


Fig. 2—Drawing showing design and location of locating stud.

avoid the possibility of chatter. Vise-jaws should never be tightened with anything but the hand; if a hammer or mallet is used, not only is the vise battered and damaged, but such practice usually results in springing the jaws.

Figure 1 is a correct layout for a set-up for a lengthwise cut, the vise being set so that the jaws are cross-wise of the table. The table indicated is of the hand lever feed type, but the same set-up should be used for a power feed machine. The vise should be set near the end of the table so that it may be operated with as little effort as possible, and if necessary, an extension can be used on the screw so that it will extend over the end of the table. The stationary and movable jaws must be in the correct relation to the cutter, as shown, and there must be sufficient clearance between the jaws and the cutter.

Locating pins should be located in the stationary vise jaw. The correct method of locating the pins in the jaw



DIA. OF PIN	A
UP TO $\frac{1}{4}$	.020
$\frac{1}{4}$ TO $\frac{1}{2}$	.040
$\frac{1}{2}$ AND OVER	$\frac{1}{16}$

is shown in Fig. 2. Where there is doubt as to the uniformity of the spread between holes on the work, a stud can be used, as shown. The contact points of the stud should be located so as to take the thrust of the cut. The table included in Fig. 2 shows the best widths to which the contact points should be made.

The design of a quick-acting vise jaw is shown in the drawing Fig. 3. This type of jaw can be used to hold any

kind of work-piece, or any number of pieces. The swinging block A, which

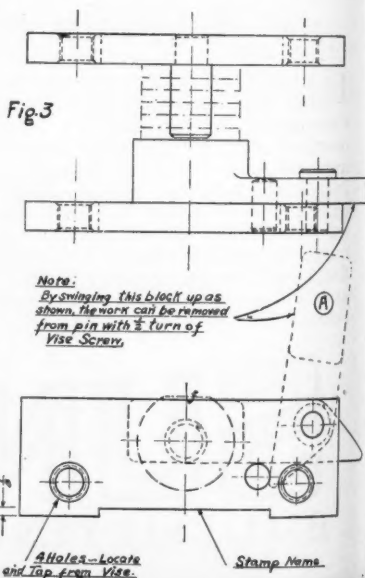


Fig. 3—Design of quick-acting vise-jaw.

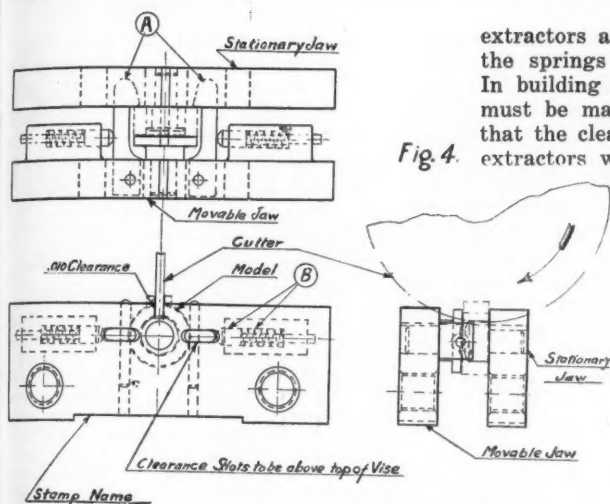


Fig. 4—Design of vise-jaws for use with air-operated vise.

is pinned to the movable jaw, is placed between the vise jaw and the work and the jaw is tightened against the work by a half-turn of the screw. A jaw of this design can be used to good advantage in practically any shop and is economical to make. When single pieces are being milled, the width of the block A should be  $\frac{1}{8}$  in. greater than the width of the work.

The drawing Fig. 4 illustrates the design of a set of vise jaws intended for use with a quick-acting or air-operated vise. The two hook-shaped extractors A are designed to remove the work from the locating pins or blocks simultaneously with the opening of the jaws, thereby eliminating a large part of the time required for unloading. The

extractors are held in place by the springs and extractors B. In building this vise, the jaws must be made high enough so that the clearance slots for the extractors will clear the chips.

At least 0.010 in. must be allowed for clearance between the jaws and the cutters. When the jaws are to be used extensively, it is a good idea to harden them.

A simple, yet efficient, fixture for use with a milling machine vise is shown in Fig. 5. The fix-

ture can be held in any milling vise and can be set up in a short time. The work is held by locating studs in the front end of the fixture, where it is clamped in position by means of a clamp lever which swivels on a central stud.

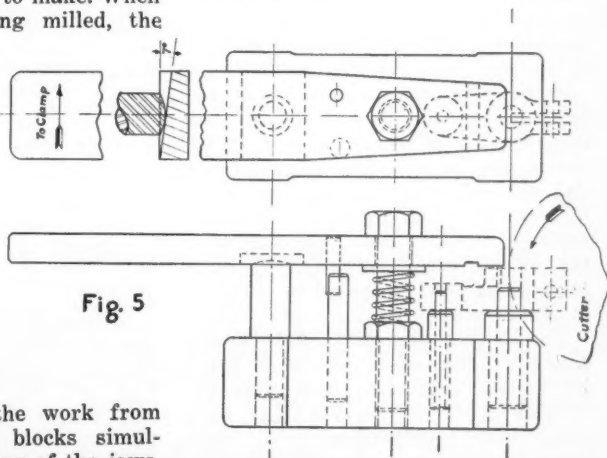


Fig. 5—A simple, but efficient, fixture for use with a milling machine vise.

The nut is screwed down to provide the proper tension, then the work is clamped instantaneously by the simple act of swinging the lever into parallel with the fixture. As it swings, a 7-deg. taper on the under side of the lever rides up over the end of a stud; thus the handle end of the lever is raised and the opposite end is borne downward into contact with the work until sufficient pressure has been applied. Care should be taken to have the angle of taper exactly 7 degrees, as this angle has been found by experience to give the best results. The base is of cast iron and the lever is machine steel, case hardened.

Dimensions have been omitted from the drawings, as it is advisable for the user to make the parts shown to dimensions that will fit his need. As the standard vise seems to be usually 6 in. or 8 in., it will be worth while in many shops to make up plain jaws and carry them in stock, ready to be adapted to the needs of the job.

### Check Up On Your Belt Drives

(Continued from Page 21)

crooked but will also damage pulleys of composition or wood.

Pulley alignment is very important from the standpoint of belt life and transmission efficiency, as well from the standpoint of safety. It is essential that all shafting, bearings, and hangers be in alignment so that the belt will be in perfect parallel with the pulleys upon which it is to operate. These factors should be included in the inspection.

Finally, the application and maintenance of belting should be handled by a man who has been properly trained in this work and is thoroughly competent. Many good belts have been ruined by badly-made repairs. If facilities are not afforded for the proper reconditioning of belting, the

work can be turned over to a reliable belt manufacturer — practically any one of whom will undertake the task, but will turn out the best job that good workmanship can produce. The plant operator who does this will be sure that his machines are "ready to go" when production starts.

### "Chapmanizing": A Process for Hardening Low Carbon Steel

**A** NEW method of rapid depth hardening whereby the cheaper grades of steel can be treated so as to produce a glass-hard surface of sufficient depth to resist unusual wear and abrasion is said to have been developed and is now being marketed by The Chapman Valve Mfg. Co., Indian Orchard, Mass. The treatment can be applied to the common grades of low carbon steels such as SAE 1020, 1025, 1112, 1120, 1315, 3220, 6115, 6120, and so on, and to all forged or cast steel parts from very small objects to individual pieces as large as 24 in. diameter by 10 in. deep. It can also be applied to malleable iron and cast iron.

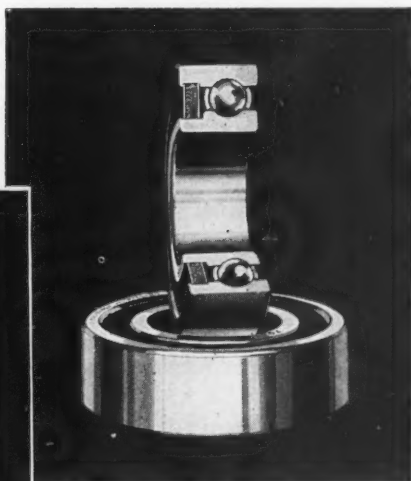
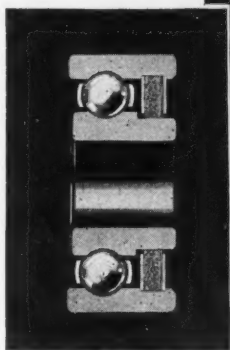
In regular process work it is said that the Brinell hardness will run from 700 to 900 and with a slight variation in the process, for certain types of steel, a Brinell of from 900 to 1100 can be produced. The usual depth of case is 0.025 in., which is satisfactory for most service.

In practically all instances material can be treated within 48 hours after receipt at the factory. It is not necessary that the surfaces to be Chapmanized be finished, but it is said that wear resistance and hardness will be much greater in surfaces that have been machined.

Full information regarding the Chapmanizing Process can be had by addressing the firm as above.

Societe Genevoise Catalog No. 560. A new model of the Swiss Jig-Boring Machine made by the Societe Genevoise is described in Catalog No. 560 which is being distributed by the American agents, The R. Y. Ferner Company, 1133 Investment Bldg., Washington, D. C. This machine, designated as the MP-2C, has a capacity of 8x12 in. and has several unique features which adapt it especially for the rapid laying out, drilling, and boring of holes up to 1½ in., even in the direct production of small series of parts in the lighter manufacturing industries. Copies gratis.

# 8 POINTS of SUPERIORITY



(1) Thick, closely fitting felts; (2) effective labyrinth formed by felt seal and plates against recessed inner ring; (3) seal removable in its entirety; (4) felt seal within confines of ring and not exposed to injury; (5) wide, solid inner and outer rings with maximum contact on shaft and housing, obviating the use of housing inserts and militating against slippage, looseness and escape of lubricant past outer ring; (6) outer ring can be clamped on both faces; (7) construction assuring dimensional exactness and quiet running; (8) grease capacity ample for long periods of service.

## "7000" SERIES



## BALL BEARINGS

WRITE FOR THE  
CATALOG

*Listing all sizes up to  
35 m/m bore, together  
with a complementary  
line of adjusting  
springs, felts and  
spring washers.*

**NORMA-HOFFMANN BEARINGS CORP., Stamford, Conn., U.S.A.**

# Lapping Process Generates Precision Surfaces

BY FRED B. JACOBS

**T**HE generation of plane surfaces by lapping antedates the Christian Era, according to some authorities. This claim can be substantiated by the fact that the emery deposits of Asia Minor have been worked since



Fig. 1—Finishing a plane surface by lapping.

remote times. Thus there is authority for the great antiquity of the original art of lapping which can be defined as the producing of planes by rubbing the work over a metal or other surface charged with abrasive grain. The foregoing of course constitutes plane lapping only. Cylindrical lapping, both internal and external, are employed extensively today in both tool room and production work. This article, however, deals only with plane lapping. While the hand lapping of plane surfaces is an

old art, machine lapping is a latter day development.

In taking up some practical lapping problems, the finishing of plane surfaces as shown in Fig. 1 can be considered first. The lap can be cast iron or a softer metal composed of tin and lead; one part lead, two parts tin. Cast iron laps, however, are used more extensively than soft metal ones. If the work is of hardened steel and is ground before lapping, a single lapping operation will suffice. However, if the work is not ground previously to lapping, a preliminary lapping operation called blocking down is necessary. A plate for this operation can be cast iron, 12 x 18 in. with its surface scored as shown in Fig. 2. The scores can be cut about  $\frac{3}{4}$ -inch apart. They should be about  $\frac{1}{64}$ -inch wide and  $\frac{1}{32}$ -inch deep.

The abrasive used for blocking down preferably is manufactured alumina, although natural emery or corundum can be employed. For ordinary work 100 grit material should be satisfactory. The lap is sprinkled with the abrasive, which can be kept in an ordinary salt cellar. Lard oil is usually used as a lubricant, and the work is lapped over the plate until a flat surface results. In the course of the lapping operation, the work is washed in gasoline and inspected several times.

A plain plate is used for finish lapping. This plate is of cast iron, and gasoline is used as a lubricant although the use of gasoline is not

# Dependability....

*Proves the Value of*

## Cincinnati "HYPRO" Openside Planers

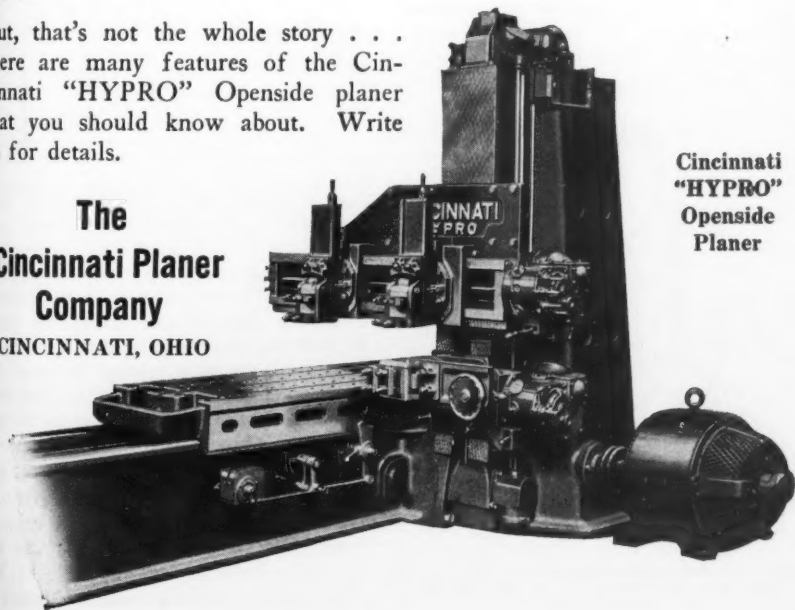
USERS of the Cincinnati "HYPRO" Openside planers know that these machines may be depended upon to do the rough work as well as the accurate work . . . and do both at a *profit*.

That is why you'll usually find a Cincinnati "HYPRO" Openside planer wherever there is planer work to do.

But, that's not the whole story . . . there are many features of the Cincinnati "HYPRO" Openside planer that you should know about. Write us for details.

**The  
Cincinnati Planer  
Company**  
CINCINNATI, OHIO

Cincinnati  
"HYPRO"  
Openside  
Planer





arbitrary by any means, as some workmen prefer lard oil. Again, others perform finishing lapping oper-

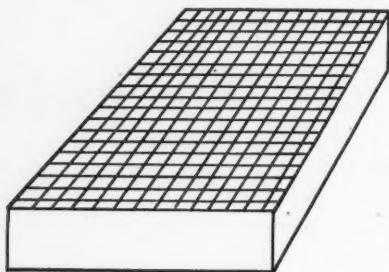


Fig. 2—Plate for "blocking down" a plane surface.

ations dry, claiming that the dry lap produces a mirror-like finish more readily than when a lubricant is used.

Generating a true plane by the lapping process is not as easy as it looks. If too much abrasive is used, the material will "bank up" at the edges of the work so that the lapping will be uneven. If the abrasive contains dirt, the impurities will scratch the work. Thus care must be exer-



Fig. 3—Bench lapping machine, consisting of a cast iron disc mounted on the end of a vertical shaft.

cised. A cast iron lap used for finishing soon becomes charged with abrasive so that it is a cutting tool itself. In this condition it will cut for a long time without the addition of extra abrasive.

A modern theory regarding the lapping process is that the action of the work over the lap causes the surface metal to "flow." If we take a piece of plush and rub its surface back and forth by hand the "pile" is laid in several directions so that the surface is rough. If we stroke the surface in one direction the pile is laid evenly and a smooth surface re-



Fig. 4—Finishing flat surfaces by lapping, using a lapping machine with a 40-in. disc, rotating at a speed of 400 r.p.m.

sults. If this theory applies to lapping by hand, the work should be rubbed over the lap in one direction only. If there is anything to this flowing of the metal surface it may account for the good results obtained by machine lapping wherein the lap runs in one direction only.

Machine lapping of metal parts has been carried on for nearly a century. Of late years semi-automatic lapping machines have been devised for the accurate finishing of gage blocks, but the original lapping machine, many of

whic  
or le  
on th  
disk  
sever  
ation  
can  
iphen  
per r  
factu  
shoul  
is en  
Lard  
In th  
cised  
of ab  
exces  
edges

Ma  
the l  
surfa  
an op

Fig. 5

lap  
diam  
and  
of 40  
speed  
minu  
this  
but t  
excel  
dry  
Turk

which are used today, is nothing more or less than a cast iron disk mounted on the end of a vertical shaft. The disk can be anywhere from one to several feet in diameter. The operation is shown in Fig. 3. Such a lap can be run at an approximate peripheral speed at the rim of 2500 feet per minute. For lapping steel, manufactured alumina, emery or corundum should be used while carbide of silicon is employed for lapping cast iron. Lard oil can be used as a lubricant. In this operation care must be exercised to see that only a small quantity of abrasive is applied at a time as an excess amount banks up at the work edges, just as it does in hand lapping.

Machine tool builders often employ the lapping process for finishing flat surfaces on a diversity of parts. Such an operation is shown in Fig. 4. The

place with the conical roller shown at the left. This roller is cast iron and the outer end of its shaft near the handle rests on a bracket when not in use. Thus the roller is kept away from the lap. The work is held in place on the lap by hand and a cross member is provided to prevent the lap from pulling the work from the operator's hands.

Gage makers must exercise unusual care in lapping plane surfaces. In Fig. 5 is shown a profile grinder of British design arranged for finish lapping a snap gage. The work is strapped to the machine table so that the soft metal lap, relieved at the sides, can be fed in and out to finish the gaging surfaces. The lap is charged with flour emery and moved back and forth past the gaging surfaces by means of the upright handle shown which actuates the entire wheel head. This operation is a good example of precision plane lapping.

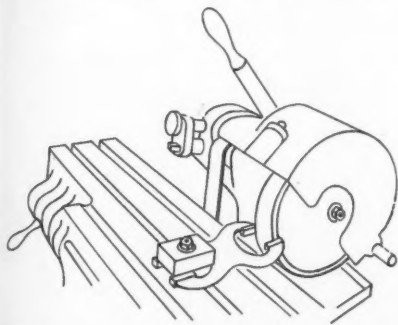


Fig. 5—Finish-lapping the anvils of a snap gage.

lap is a steel disk, 40 inches in diameter, faced with an alloy of lead and tin. The lap rotates at a speed of 400 r. p. m., equal to a surface speed at the rim of 5000 feet per minute. According to some authorities this speed is excessive for lapping, but the device shown in Fig. 4 gives excellent results. This lap is used dry and is charged with No. 40 Turkish emery, which is rolled in

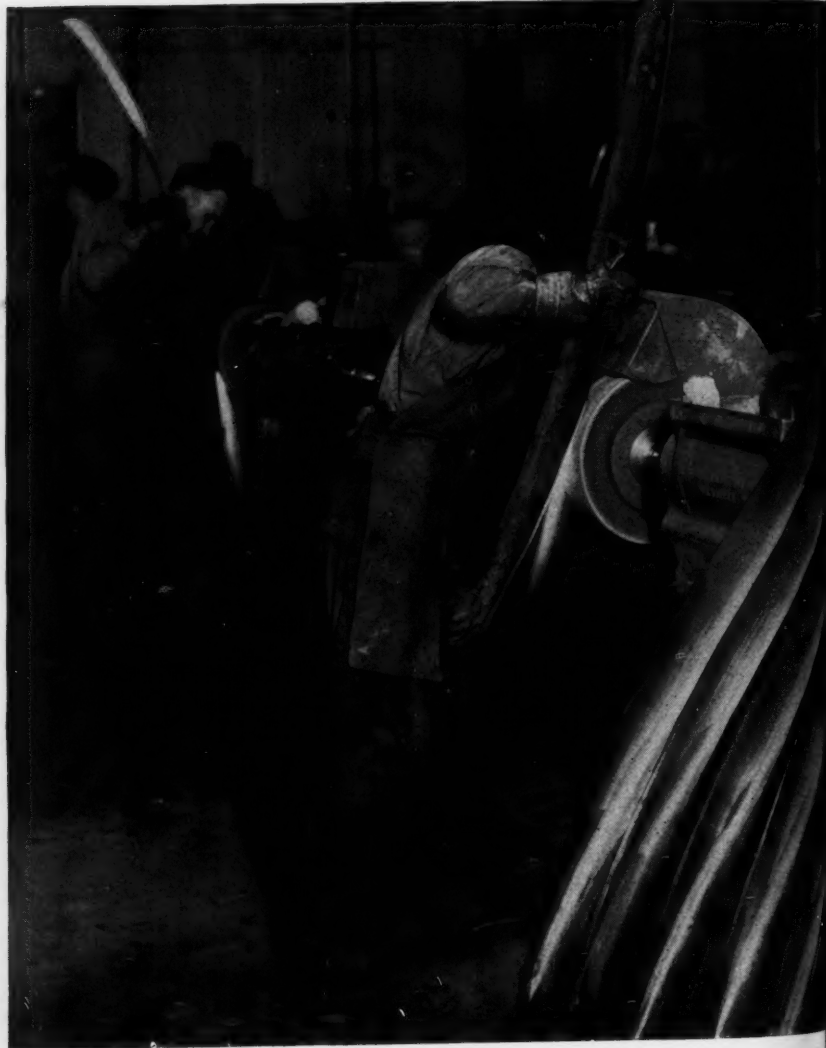
### "Precision Made Easy"

UNDER the above title, The Comtor Company, Waltham, Mass., has issued a four-page bulletin in which the Comtor System of Rapid Precision Gaging and Size Control is described, with illustrations of the instruments involved. The system applies to the production and inspection of inside and outside diameters and flat dimensions of mechanical products. It is a complete system developed to meet the requirements of actual production, and is based upon a set of principles which are outlined in the bulletin.

This bulletin should be of interest to chief engineers, chief inspectors, works managers, plant superintendents, and other mechanical executives who are concerned with the speed, efficiency, and cost of inspection. Copies available upon request.

The most progressive manufacturer can give you the best service. The manufacturers represented here are among the leaders in their industry; patronize them and mention MODERN MACHINE SHOP when doing so.

# For Gleaming Bums



Alum  
Will  
Polish

NO mat  
be the  
abrasive  
economical

for the  
alum  
treated t  
enable th  
ake a st  
le in siz

for many  
g there  
high ca

NORTON

New York  
Pittsburg  
London

# ... or Humble Shovels...

## Alundum Abrasive Will Do Your Polishing Job Right

NO matter what your polishing job may be there is a type and size of Alundum abrasive to do it right — and that means economically.

For the tough, strenuous jobs there is Alundum "C" Abrasive. It is specially treated to give it high capillarity—to enable the glue to grip it securely and make a strong, rugged wheel head. Available in sizes 80 and coarser.

For many less strenuous jobs and for finishing there is Alundum "B" Abrasive—also high capillarity grain.

NORTON COMPANY, WORCESTER, MASS.

New York Chicago Detroit Philadelphia Cleveland  
Pittsburgh Hartford Hamilton, Ont.  
London Paris Wesseling, Germany

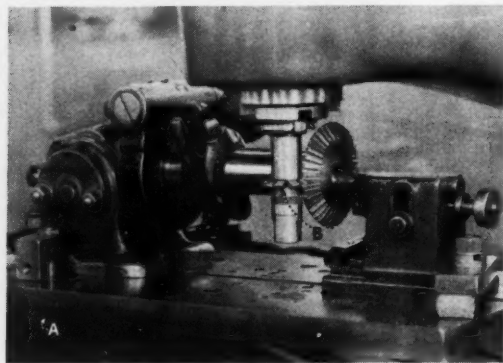


## IDEAS FROM READERS

### Improved Setup for Cutting Bevel Gears

By JOHN McCULLAGH

**I**T sometimes becomes necessary to cut a bevel gear in a shop that is without the facilities of a gear cutter, in which case it may be possible to improvise a setup, using a vertical milling machine and a dividing head.



Vertical Milling Machine Adapted for Cutting Bevel Gears

Such a setup is shown in the illustration.

The only machine available was a plain type vertical miller with a table which could not be swiveled. In order to provide for cutting the teeth at the correct pitch angle, a baseplate A was keyed and clamped to the machine table as shown, then a dividing head and tailstock were mounted on the baseplate. The gear, which was integral with a stub shaft, was then mounted between the centers, a standard gear cutter B was mounted on a stub arbor and inserted into the

machine spindle, and the job proceeded. No outer support was needed for the cutter-arbor.

Even had a horizontal milling machine been available, the cutting of the gear would have presented a problem, because the gear shaft was several inches in length and with the dividing head tilted upward to the proper angle, the gear would have been too high above the table to permit machining without chatter and vibration. In such a position it would have been impossible to use a tailstock support, with the result that the setup would have been a failure.

By using the vertical machine and the setup shown, however, the teeth were accurately cut, using normal feeds and speeds. The table was locked in position after the proper setting to depth had been made, after which the saddle cross feed was applied for the cutting operation.

### A Handy Grinding Fixture

By AVERY E. GRANVILLE

**T**HE illustration shows one of the handiest fixtures imaginable for use in grinding the faces of small dies, ends of punches, and for other jobs of a similar nature. The fixture is of simple construction and is easily operated. Roughly, it consists of two plates hinged at the back and equipped with an adjusting screw

August,

near the  
can be  
face t

angle  
wheel.

Both  
over, a  
face of  
should  
that w  
about  
out di  
justin  
vided  
and is  
a hole  
plate  
that it  
fective  
upper  
absenc  
grinde  
used t  
ing w  
being  
stub a  
spindle  
can be  
lathe,  
that t  
is need  
may b

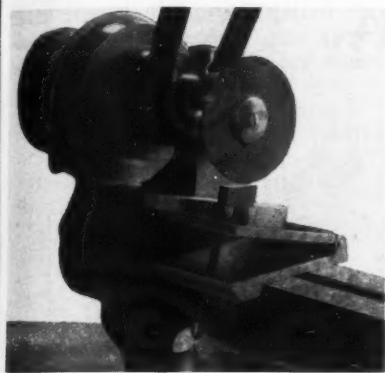
near the front, so that the upper plate can be tilted and thus bring the surface to be ground to the required

## Lap for Locomotive Exhaust Pipe Seats

By H. H. HENSON

A SIMPLE and efficient lap for lapping-in locomotive exhaust pipes to their seats is shown in the accompanying drawing. The lap is primarily a disc with a shank by which it can be held, and grooved to hold the abrasive material used in the lapping process. The disc is forged of soft steel and after being turned to finish size is hardened and ground, thus insuring the extreme accuracy required to lap the joints to a steam-tight bearing. A spiral groove is cut into the face of the disc, either by cutting in with a tool before hardening, or grinding in with a small-diameter wheel after hardening.

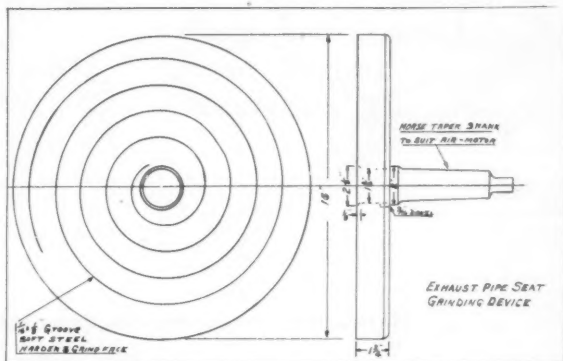
The lap is revolved by means of an air motor, and in making the lap, a Morse taper shank is provided of a



A Handy Grinding Fixture.

angle for finishing with the grinding wheel.

Both plates should be finished all over, and working surface of the upper plate should be ground so that work can be moved about and located without difficulty. The adjusting screw is provided with a handle, and is threaded through a hole in the bottom plate at such an angle that it will be most effective in raising the upper plate. In the absence of a suitable grinder, a lathe can be used to drive the grinding wheel, the wheel being attached to a stub arbor which is inserted into the spindle of the machine. The fixture can be made to suit the bed of the lathe, or adapted to the carriage so that the feeds can be used. If a guide is needed on the fixture, a parallel bar may be clamped in position as shown.



Drawing of Lap for Locomotive Exhaust Pipe Seats.

size that will fit the motor selected to do the work. In operation, the motor is attached to the lap, a good grade of abrasive is applied to the face of the disc, and the disc is revolved until the joint is flat and smooth. The abrasive can be emery

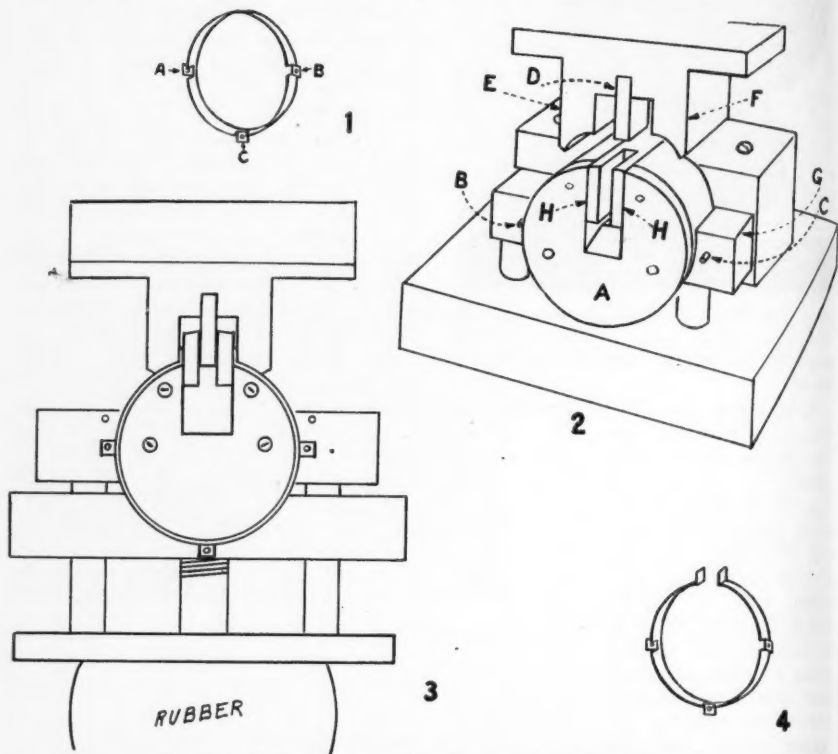
or crushed steel. To one who has never used such a lap on this job, it will be amazing to see the speed with which the surface of a rusty and uneven joint is cut down to a steam-tight joint.

The efficiency of the device depends,

## Combination Cutting and Forming Tool

BY CHAS. H. WILLEY

**A** COMBINATION tool with which a ring clamp is formed, a section is cut out of a ring clamp and



Drawing illustrating a combination cutting and forming tool.

of course, upon the accuracy of the face of the lap. It has been the writer's experience that the best way to obtain a perfectly true and flat face on the disc is to chuck the disc in a lathe and grind the face with a tool post grinder, using the crossfeed of the lathe. Any competent tool-maker can make this lap at a very small cost.

a pair of ears are formed at right angles may be of interest to some of the readers of MODERN MACHINE SHOP. The ring, Fig. 1, is cut from a section of tubing and the ears A, B and C are formed at the points indicated, 90 degrees apart, which is a simple operation. The ring is then placed in position over the cylindrical piece A, Fig. 2, where it is located



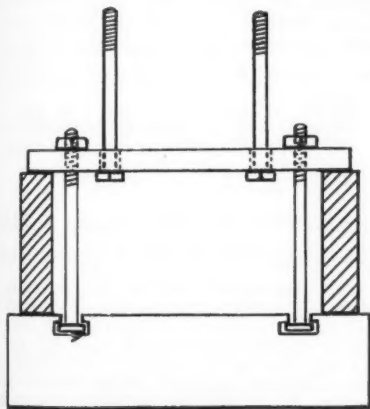
by slipping the holes in the ears over two pins B and C.

In action, the rectangular punch D strikes the work first, cutting out a section and leaving a gap. The forming punches E and F then grip the work, and as the section G is supported on pressure pins, the section is forced downward. The piece H—H however, is stationary; thus the ends of the piece are bent upward, forming the ears as shown in Fig. 3, to the shape shown in Fig. 4.

## A Clamping "Kink"

By C. R. DILTHEY

**I**N cases where the work that is to be clamped to the table of a machine is so large that the longest bolts available are too short for use,



Sketch showing method of using an extra clamp where long bolts are not available.

the work can be clamped by the use of an extra strap and blocks as shown in the illustration. Four holes are drilled in the strap; two holes for the bolts by which the strap is held to the machine-table, and two holes for the bolts that are to hold the strap which holds the work in place. Also,



## Universal Joints

(PATENTED)



Apex Universal Joints are time tested—simple in construction and exceptionally strong. No projecting ears, pins or screws. Diameters from  $\frac{3}{4}$ " to 3". Can be machined to meet any requirement. Approved for Aircraft use.

## Apex Universal Joint Socket Wrenches



Apex Universal Joint Socket Wrenches for tightening nuts or cap screws in hard-to-get-at places are real time and money savers. Made in any size required for any electrical or air tool. Cannot over-travel their maximum working angle. Low first cost—long life—increased production.

Try Apex Universal Joints and Socket Wrenches. You will profit. Write for full information and catalog.

THE APEX MACHINE & TOOL CO.  
THIRD & MADISON STS., DAYTON, OHIO

by using a U-strap, the bolts that hold the work can be shifted to line up with openings in the work or to miss projections in cases where the work does not line up with the T-slots in the machine-table. This "kink" is simple, but the simplest solutions to our problems are often the hardest to perceive.

## Forbes Apprenticeship Article Develops Interest

**I**N your May issue you printed a description of our plans for apprenticeship as soon as business conditions make it practical to start such a program. The next day replies started to come in, replies that demonstrated that your magazine is read by responsible executives in industry. Yet replies of the nature that would be most expected, replies from boys looking for apprenticeship, or from parents looking for them, were strangely absent. Not a single one was received. This is merely another demonstration of the fact stated in the article, "Today it is useless to expect voluntary applications for apprenticeship."

And yet this statement was vigorously attacked by one man, who asked me to consider his letter a voluntary application. According to his own statement he had taken a four year vocational school course and he gave the impression that he had also worked for three years. He should realize that the time had long passed when he could be a suitable candidate for apprenticeship of the kind described in the article. In this article I mention two types of boys whom we could get, but whom we could not accept as apprentices. I should have mentioned this third type, young men, and not always so very young, who have not been successful with their

first start and want to try again. But apprenticeship, at least our apprenticeship, is not for purposes of salvage. It is not intended to give a second start to the unemployed or to fit into industry those who have completed a course of vocational education for which there is no demand, however worthy these objects may be. It is for boys (not young men) who wish to choose this form of vocational education in the first place.

If there are still any boys interested in apprenticeship, or parents ready to consider apprenticeship for their boys, there is one point that I would like to call to their attention. Inquiries about apprenticeship should be made early. When the boy is ten or twelve years of age is none too soon. A few years should be allowed to look into the different kinds of programs, for they are of all kinds. There should be time to think over and talk over the various plans which may come to attention during a period of years.

(Signed) A. W. FORBES, *President,*  
*Forbes & Myers, Worcester, Mass.*

## Research Leather Belt Rating Tables For Economical Power Transmission

This, the second edition of this publication, gives directions to the plant engineer or managing executive for the making of substantial savings through correct application of leather belting. The book contains a Belt Speed Chart by which a direct reading of belt speed may be obtained merely by holding a ruler or straight edge across the columns of figures giving the pulley diameters and the pulley speeds. Another table shows the belt ratings at 180 deg. arc of contact for every belt thickness at every speed, with the minimum recommended pulley diameters for each belt. Correction factors are given for open drives where the arc of contact is less than 180 degrees. Copies of this book are available without charge to metal-working plant executives. Address requests to Graton & Knight Company, Worcester, Mass.

## The Answer is Good Gearing

To meet every requirement of quality and service, there is no substitute for good gearing. PERKINS Gears . . gears for every purpose . . are used by hundreds of manufacturers.

Their answer to good gearing is PERKINS Gears.

### A HELPFUL CATALOG

Many pages in the Perkins 102 page catalog contain tables and gear calculation data. Mechanical executives and designers find this catalog extremely useful.

WRITE FOR YOUR COPY TODAY

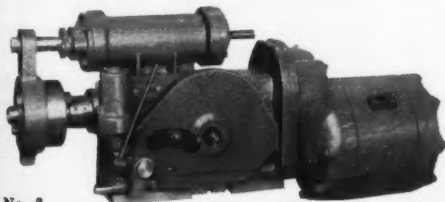
**PERKINS MACHINE & GEAR CO.**  
151 Circuit Ave. Springfield, Mass.

## MILLHOLLAND

### .. *Pioneers in the Automatic Unit Field*

FOR seven years, MILLHOLLAND has specialized on automatic drilling units, serving the largest and most progressive manufacturers in the U. S. and abroad. Installations in some plants total over 250 units. The wide experi-

ence of MILLHOLLAND in applying automatic units and in developing completely tooled automatic machines is at your service. Widest range of units now available . . . 1/3 H. P. in various sizes up to 15 H. P.



No. 3  
Automatic Tapping Unit. 3" stroke, 1, 2, 3 H. P.

No. 2 Millholland Automatic Drilling Unit—2 1/2" stroke—1/3, 1/2, 3/4 H. P. Motor Drive.

No. 3 Unit—3" stroke, 1, 2, 3 H. P.

No. 4 Unit—4" stroke, 1, 2, 3 H. P.

No. 5 Unit—5" stroke, 5 H. P.

No. 6 Unit—8" stroke, 15 H. P.

Milling Heads attachable to any of these units.

Let us show you how to profit by the use of Millholland Units in your own plant.

**MILLHOLLAND SALES CO., INDIANAPOLIS, IND.**

## Over the Editor's Desk

### "The Old Order Changeth"

THE most important matter of the moment, as we go to press, is the National Industrial Recovery Act and its effect upon the economic condition of the country. It is too early as yet to form any estimate of the influence that this act may have upon the industrial set up; in fact, there are very few who understand clearly what the N. I. R. A. consists of and what it is intended to do. The air has been filled with rumors that the N. I. R. A. is going to make it possible for the larger industries to squeeze the little fellows out of business and some of the larger industries have been apprehensive that the operation of the N. I. R. A. would give the little fellows a very decided advantage. It would undoubtedly help to clear the atmosphere greatly if all those who are directly concerned with the N. I. R. A., its operation, and potential benefits, would make themselves fully acquainted with the purpose and intent of this act.

However, before considering the N. I. R. A., let us first examine the foundation upon which it is based. The very first sentence of Section One reads "A national emergency productive of industry unemployment and disorganization of industry, which burdens inter-state commerce, effects the public welfare, and undermines the standards of living of the American people, is hereby declared to exist." That such an emergency exists and that its effects are as stated cannot be denied. The foundation then, is sound.

The next sentence explains what Congress intends to do about the aforesaid emergency. It reads "It is hereby declared to be the policy of

Congress to remove obstructions to the free flow of inter-state commerce which tend to diminish the amount thereof, and to promote the organization of industry for the purpose of cooperative action among trade groups, to induce and maintain united action of labor and management under adequate governmental sanction and supervision, to eliminate unfair competitive practices, to reduce and relieve unemployment, to improve standards of labor, and otherwise to rehabilitate industry and to conserve natural resources."

Note well the phrase "and to promote the organization of industry for the purpose of cooperative action among trade groups." The Anti-Trust laws of what may now be considered a bygone era were intended to discourage this very thing. The organization of industry was prohibited on the ground that such organization might tend to maintain exorbitantly high prices. These laws were intended to equalize the opportunity for all in any line of industry. It has become apparent that under such restrictions it is no more true that the opportunity is equal for both the large and small units of industry than it is true that all men are born equal. Under such laws open competition was considered necessary to the public interest and the fact that every seller was also a buyer received little or no consideration.

The old system of free and unrestricted competition may have been useful at a time when our country and its industries were younger, but that has passed. Conditions today are different. If free and unrestricted competition has brought us to our present economic state, then obviously some kind of regulation is necessary to achieve the objective outlined in the bill.

Boiled down, the N. I. R. A. means just this; employers are expected to either perfect existing trade associations or to form new ones that will be truly representative of the industry. Labor, as we understand it, has the same privilege. Representatives of great associations are then required to work with labor through its representatives for the purpose of establishing standards of hours and wages. Maximum working schedules will be agreed upon and minimum wage scales will be set. Having set the standards for labor, it then becomes necessary for the trade association to prepare a code of fair competition, bearing in mind that this is intended to eliminate underselling and other so-called "cut throat" practices, that it requires compliance with any prescribed minimum rates of pay, that it requires compliance with regulations regarding hours and working conditions, and that it extends to employees the right of self organization and collective bargaining.

Failure of those engaged in any trade or industry to formulate an equitable code may subject any trade or industry to a mandatory code, and whether the code is voluntarily prepared or mandatory, it will govern every one in the particular trade or industry. Having set the standards and prescribed the code of fair competition the entire matter is referred to the President and when approved by him, becomes operative. Violation of standards or the code of fair competition are punishable in various ways as described within the act.

The licensing feature embodied in the act is a coercive measure and may be used by the President when deemed necessary. It is intended primarily to force mutineers and recalcitrants into line and to insure proper behavior under the law. No fair minded law abiding citizen need fear the consequences of this provision any more

than he need fear the consequences of any other law. The sum and substance of the whole thing is that hours of labor are to be shortened so as to distribute employment to the greatest possible number of workers, decent living wages are to be paid thereby improving and increasing purchasing power, and reasonable profits to industry are to be made possible through the increased purchasing power and through the enforcement of codes of fair competition. Competition is not to be eliminated nor is it intended that it shall even be lessened, but it is intended that it shall be distinctly fair competition and not of the brand that has existed through the past several years.

The N. I. R. A. is intended to force and compel, if necessary, fair competitive practices and to eliminate through the medium of severe punishment—if necessary—all unfair competitive practices. Everyone knows the difference between what is fair and what is unfair—between what is right and what is wrong. Competition is to be open, but it is to be conducted according to certain rules. These rules are to be predicated upon the principle of fairness and justice, the intention being to give all equal opportunity with special privileges to none. Those whose conduct in the past has been based upon generally understood ethics have nothing to fear; those whose ethics have been the ethics of the wolf pack will have to revise first their methods of thinking and then their methods of operation. It is not at all unlikely that more or less adjustment will have to be made in our industrial system to the requirements of the N. I. R. A., but those who are really looking for an opportunity to put their shoulder to the economic wheel will give the act the benefit of the doubt and work with it as far as possible before attempting to criticize it.

## NEW SHOP EQUIPMENT

### Heald No. 48 Bore-Matic

TO meet the demand for a small machine of the same type as the Heald "Bore-Matic", capable of handling a variety of work economically, yet having all the automatic features customarily associated with the large machine, The Heald Machine Company, Worcester, Mass., has brought out the No. 48 "Bore-Matic" shown in the illustration. In addition to the field of the smaller shop, it is expected that the machine will find a field in high production lines where it is desired to keep one machine set up for each job, instead of using a multiple setup on a larger machine.

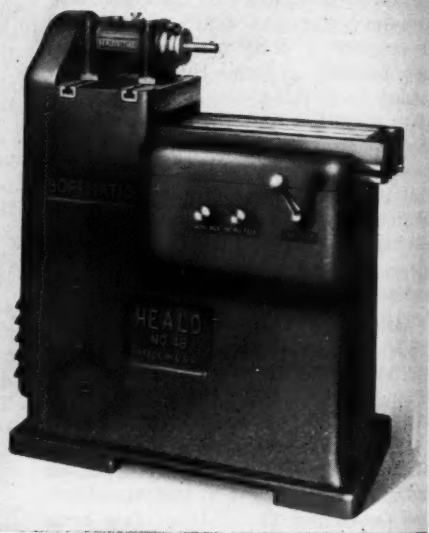
The No. 48 machine is simple and compact in design, yet rugged. It is entirely automatic in operation, requiring no manipulation by the operator except to unload, load, and start the machine. The base of the machine consists of a heavy semi-steel casting of box section, with carefully designed and properly-placed ribbing to provide maximum rigidity. Three-point contact on the floor prevents distortion.

The table is a heavy, well-ribbed casting, supported on one flat and one V way and lubricated automatically from the hydraulic system. The movement of the table is controlled by the hydraulic system on the boring stroke and by a gravity mechanism on the return stroke. Ample room is provided for locating fixtures on a finished pad 9 in. wide x 22 in. long on top of the table, and two T-slots running the length of the pad provide means for clamping. A removable hand crank acting on a screw underneath the table assists in setting up, making it possible to set the dogs quickly and accurately.

The bridge of the No. 48 machine is narrower than on the larger machines, accommodating only two boring heads. It is shorter, also, necessitating the use of shorter heads than those used on the No. 46 and 47 machines. Three sizes of heads are available for this machine.

The machine is driven by a single 1800

r.p.m. motor direct-connected to a high duty hydraulic pump located low within the base. The motor and pump can easily be slid out of the base as a unit, after disconnecting two pipes. The boring head drive is from the opposite end of the motor shaft, by means of multiple V-belts, as with the other "Bore-Matics". With the various motors that can be



Heald No. 48 Bore-Matic.

used, this motor gives a speed range to the boring heads of 625 to 3,600 r.p.m. When lower speeds are desired, a 1200 r.p.m. motor can be specially fitted, with a hydraulic pump of larger capacity, to give a speed range of 425 to 2,400 r.p.m.

The control box consists, in addition to the start and stop mechanism, of two practically identical units which control respectively the boring and facing feeds. They can also be used for two different boring operations. If necessary, a third unit can be added, to give a third cutting feed to the table. Boring and facing



feeds are controlled by the knurled knobs which project from the front of the control box.

The boring spindles are always free to turn when not being driven, which is an extremely valuable feature in setting up. The crank makes it possible to set the dogs which control the boring stroke quickly and accurately. This convenience of set-up makes the machine ideal for short jobs without sacrificing any of the advantages of the Bore-Matic design.

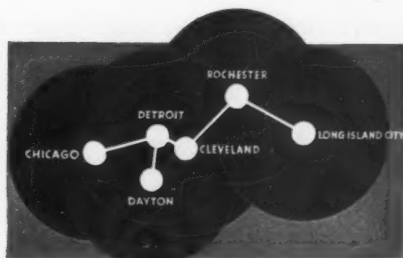
By moving the start and stop lever on the right hand end of the machine to the left, the motor will be started and the table will be started on the "in" stroke at rapid traverse. The table will continue at rapid traverse until the boring cam strikes the boring feed lever which projects from the top of the control box. This slows down the table according to the setting of the "Boring Feed" knob. The table continues at boring speed until the facing cam strikes the facing feed lever, which reduces the table speed still further, under the control of the "Facing Feed" knob. The screw in the stop dog then strikes a lever that snaps down and cuts off the power to the motor, at the same time braking the motor and boring heads by means of the back pressure against the pump. The table has a dwell at the extreme "in" position to give the spindles time to stop before the table starts back to its loading position.

Coolant can be provided on the work, where desired, from a separate, self-contained, motor-driven pump and tank unit. The coolant and boring chips are conducted away from the machine as rapidly as they drain from the table. The tank is easily cleaned out, when necessary, without disturbing the machine proper.

## H & G Self-Opening Die Head For No. 2 B & S Screw Machine

A self-opening die head especially designed for use on the No. 2 Brown & Sharpe automatic screw machine has been brought out by The Eastern Machine Screw Corporation, New Haven, Conn. The head will thread up to full 1-in. diameter up to 2 in. long in both coarse and fine pitches, thus enlarging the range of work that can be threaded with a self-opening head on this machine.

The use of a self-opening die head instead of solid dies for threading these large diameters provides many advantages. Since high speed chasers are used,



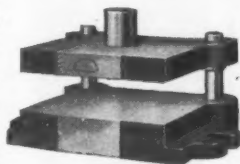
# LESS Than a Night's Ride Away

BETTER DIE SETS . . .  
LOWER FINAL COSTS  
ARE WAITING FOR YOU

**W**ITHIN the area circled above lies 80% of all manufacturing—85% of all metal fabricating. For each plant, within the circle, in which it lies there is a source of better die sets which will mean lower final costs—a Danly Branch Office Plant. Under the Unique Danly Plan, these branches are also complete assembly plants that make available any die set in the Danly Line covering 18 designs and 998 sizes and combinations of shoe and punch holder thickness and material. By available, we mean for shipment within 24 hours or less, under all usual conditions.

We will be glad to place complete information before anyone interested.

**Branches:**  
Long Island City,  
N. Y.  
36-12 34th St.  
Detroit, Mich.  
1549 Temple Ave.  
Cleveland, Ohio  
1444 E. 49th St.  
Dayton, Ohio  
226 N. St. Clair St.  
Rochester, N. Y.  
16 Commercial St.



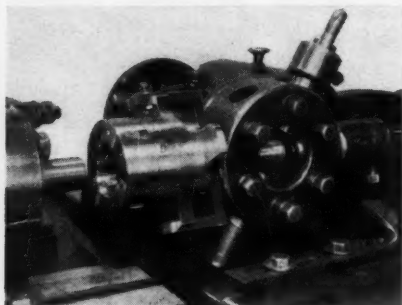
**DANLY MACHINE SPECIALTIES, Inc.**  
2122 South 52nd Avenue Chicago, Illinois

# DANLY

## Die Makers Supplies

higher cutting speeds are possible. Chasers may easily be resharpened many times.

It is not necessary to reverse the spindle for backing off; thus the fol-



B. & S. Screw Machine Equipped with H & G Self-Opening Die Head

lowing advantages are obtained: elimination of wear and tear on the machine due to shock of reversal; elimination of the time previously lost in backing off the thread; elimination of torn threads from

backing off; use of the usual reverse as a second forward speed.

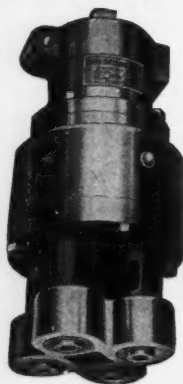
This die head, in spite of the limited outside dimensions, takes the same chasers as are used in all 1-in. sizes of H & G die heads.

### Dickerman Hitch Feed

By using the feeding mechanism shown in the illustration, either strip or rolled stock can automatically be fed through a power press, with or without pilot. This mechanism, known as the "Dickerman Hitch Feed", can be attached to any type of die set, rather than to the machine itself. The mechanism is being marketed by The Product Machine Company, Bridgeport, Conn.

The advantages claimed for the hitch feed are that it is easily set up, easily adjusted, and quickly available for operation. When applied to a machine, an operating cam is attached to the punch holder, so that on the downward stroke of the press the cam rides on a hardened roll and stud which forces the slide back. On the upward stroke, a release spring functions so that the stock is

## More Holes per Minute



And a better profit for you . . . that's the result of applying U. S. Multiple Units to your drilling machines.

By specializing in the design of special Drill Head Units, we can easily meet your requirements of accuracy and economy.

Send blue prints for estimates.

**The United States Drill Head Co.**

1954 Riverside Drive  
CINCINNATI, OHIO

## NUMEROUS

### Improvements

have been made in the  
past three years in the

## G S I P SWISS JIG BORERS

They are made in

### 7 Sizes

Tell us the range of jobs you have to do and we shall gladly recommend the best machine and tell you of the changes that have been made in it.

**THE R. Y. FERNER CO.**

1008 15th St. N. W. Washington, D. C.

August,

pushed  
stroke,  
The  
by the  
in the  
plates  
stock,  
backin  
to fee  
In the  
vision

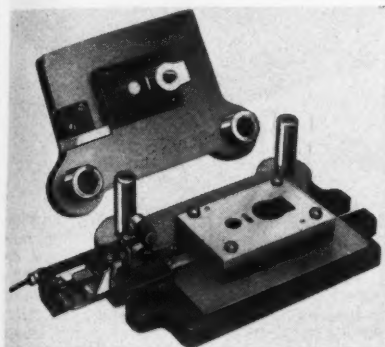
Dicken

one d  
The  
for m  
feed s  
up to  
thous

The  
kind  
been  
ing  
The  
sical  
and  
stamp  
abilit  
manu  
to a  
It pe  
tensi  
destr  
man  
other  
the  
meta

pushed through the die to the required stroke,

The exact length of feed is determined by the use of an adjusting nut as shown in the illustration. Hardened gripper plates are used for actually feeding the stock, one plate holding the stock from backing up and the other functioning to feed the stock the required distance. In the event that pilots are used, provision is made for the stock to slip in



Dickerman Hitch Feed shown attached to a die holder.

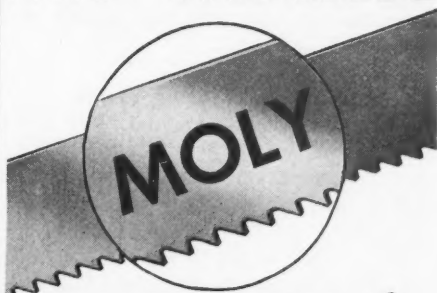
one direction only, for pilot registering.

The Dickerman Hitch Feed has capacity for material up to  $2\frac{1}{2}$  in. wide and will feed stock from a minimum of  $1/64$  in. up to 2 in. with adjustments as fine as thousandths of an inch.

### Armco Develops New Deep Drawing Sheet Metal

The development of a remarkable new kind of deep drawing sheet metal has been announced by The American Rolling Mill Company, Middletown, Ohio. The new metal has many unusual physical properties new to ferrous metals and of great importance to the metal stamping world. It has remarkable ability to be drawn and spun, permitting manufacturers of pressed metal products to adopt still more intricate designs. It permanently retains its ductility and tensile strength. Tempering does not destroy its drawing qualities. In the manufacture of automobile bodies and other articles where it is essential that the surface be unimpaired, the new metal will be of exceptional value. When

## LOOK for this MARK



your assurance of obtaining genuine "MOLY" blades

Only blades that are die-stamped "Moly" are genuine "Moly" hack saws—the saws that have saved thousands of dollars for industry through lower metal-cutting costs.

For faster cutting, longer saw life, greater hack saw value—specify genuine "Moly" Blades.

## GENUINE "MOLY"

Blades are made only in the Star brand by

**CLEMSON BROS., INC.**

MIDDLETOWN, N. Y.

and in the Victor brand by

**VICTOR SAW WORKS, INC.**

MIDDLETOWN, N. Y.

These two companies are the sole licensees of Genuine "Moly" Hack Saws.

**"MOLY" HACK SAWS**

properly processed, tests have shown it to be practically free from stretcher strains which mar the surface and cause rejections.

The American Rolling Mill Company will soon start commercial production of this unique metal. The automotive industry and other users of high finish deep drawing sheets will probably be the first to have it made available to them.

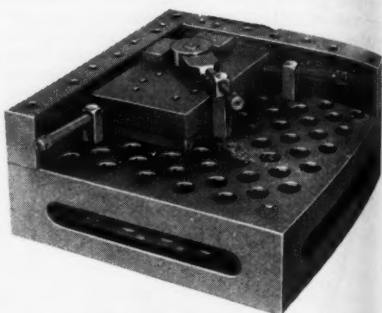
### Universal Drilling Plates

Jig plates, die blocks, and other tool work can be accurately drilled by the use



THE CHAS. L. JARVIS CO., Gildersleeve, Conn.

of the Universal Drilling Plate, now being marketed by the National Tool & Machine Co., 41 South Water St., Rochester,



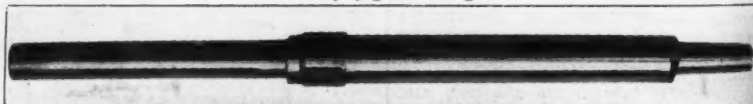
Universal Drilling Plate

N. Y. Sliding clamps securely hold the work in place against the side rails, which are square, and dimensions are obtained by the use of gage blocks and a master disc gage. The master disc gage is made from a high grade non-distorting steel, heat treated, ground, and lapped to 0.00006 in. The hole in the gage is ground on a taper for the quick removal of the bushings.

By using the Universal Drilling Plate, it is said that holes can be drilled with an ordinary drill press and spaced as accurately as with a high-priced machine. All holes can be drilled and reamed by shifting the master drill disc, using the proper gage blocks to give the required dimensions of holes to be drilled.

The plate is furnished complete with four plain sliding clamps, one swivel sliding clamp, one wrench, one disc clamp block, one Master drill disc, and five bushings. Net weight, 48 pounds.

**BORING and REAMING with T. C. are sources of moneymaking with NATIONAL carbide boring tools (Adjustable) and NATIONAL rotary jig bushings.**



1312 Mt. Elliott  
Detroit, Mich.

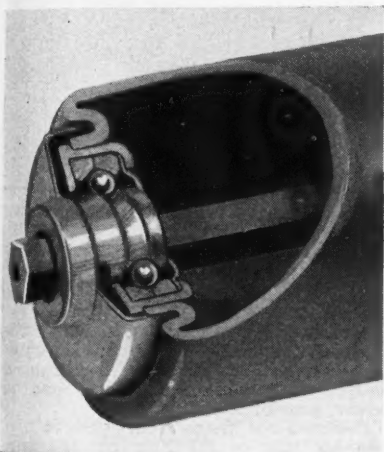
Boring Bars Built to YOUR Specifications  
**NATIONAL BORING TOOL CO.**

Branch Office  
2129 W. Venango St.  
Philadelphia, Penna.

### Standard Combination Conveyor Roller and Bearing

A combination gravity roller and bearing has been placed on the market by the Standard Conveyor Company, North St. Paul, Minn. Each end of the roller is formed in one piece to receive the bearing, and a recess is provided in the end of the roller to receive a stationary dust shield that is attached to the inner ball race. An inner steel shield is also made a part of the bearing, fitting closely against the inner race to retain the grease.

A hexagon axle prevents the inner race from turning, and a corresponding



"Standard" Combination Gravity Conveyor Roller and Bearing.

shaped hole is punched in the side rails, making a positive lock at this point.

This combination is furnished packed

### FLYNN MICROMETER

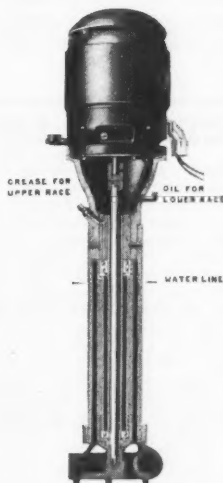


#### OFFSET BORING HEADS

Made in Various  
Sizes and Styles  
Send for Complete  
Information

**WATERSTON'S** 426 Woodward Ave.  
Detroit, Michigan

## BROWNIE COOLANT PUMP



### Efficient

The Brownie Pump has exceptionally large capacities with surprisingly low horse power input required.

Capacities 10—100 G. P. M.

Open and closed types.

Write for literature and prices.

Mfg. by

**Tomkins-Johnson Co.**

620 N. Mechanic St.  
Jackson, Michigan

with grease, and for extremely wet or dusty conditions of service the end of the shaft is drilled for regreasing or flushing of the bearing. The outer end of the bearing cone is counterbored so that the grease can go completely around the shaft and through holes in the cone into the space allowed in the bearing and between the bearing and the shields. The fact that the protective barrier consists of grease and can readily be renewed provides for much longer service than can be obtained from unprotected bearings.

## QUICK LOW

**S  
E  
R  
V  
I  
C  
E**

When you need bushings and bearings quickly look to Bunting—500 different sizes completely machined and finished, always in stock . . . When you need bearing metals ask any mill supply wholesaler for Bunting Cored and Solid Bronze Bars and Bunting Lead Base Babbitt. Write for 8-page catalog.

**C  
O  
S  
T  
:  
:  
:**

**The Bunting Brass & Bronze Co.**

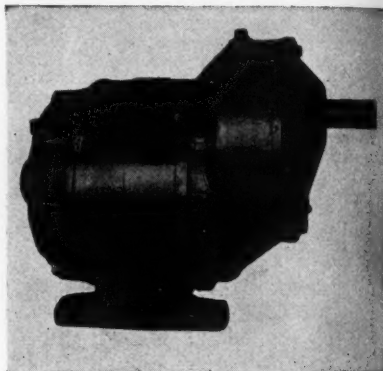
TOLEDO, OHIO

Branches and Warehouses:  
New York, Brooklyn, Chicago, Boston,  
Detroit, Cleveland, Philadelphia, Dallas,  
Kansas City, Los Angeles, Seattle, San  
Francisco. Export Office: Toledo, Ohio.

**BUNTING**  
QUALITY  
PHOSPHOR BRONZE  
BUSHING BEARINGS  
PATENTED

## Westinghouse Type S Gearmotor

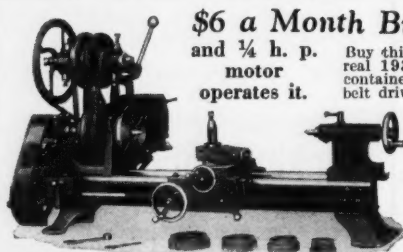
Where mechanical means are required for reducing the normally high motor speed to satisfactory operating speeds, the Type S Westinghouse Gearmotor pro-



Westinghouse Type S Gearmotor

vides an extremely simple and compact unit for low operating speeds. The Gearmotor, which is made by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., is scarcely longer than a motor. The compactness of the Gearmotor makes possible substantial economies in equipment design, in space requirement, and in power consumption.

Designed for drives from  $\frac{1}{2}$  to 75 h. p. and for 1550 to 232 r. p. m., the drive may be connected direct to the driven equipment or by cog-belts, chains, or flat belts. Fourteen reductions of ratios of 1.12:1 to 5.1 are available for each new motor speed and horsepower. Helical gears, fully enclosed and running in an oil bath, provide for quiet operation.



## \$6 a Month Buys This ATLAS 9" LATHE

and  $\frac{1}{4}$  h. p.  
motor  
operates it.

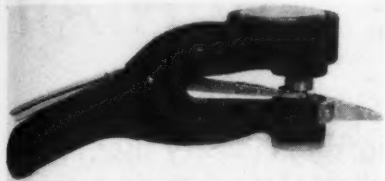
Buy this modern tool out of its power savings. ATLAS is real 1933 construction—not a rebashed 1915 model! Self-contained countershaft, motor brackets, switch; patented V-belt drive; 45 parts of Zamak alloy twice as strong as cast iron. Six speeds: 4 to 72 threads; compound rest; hollow spindle; 18" between centers, also larger sizes; \$79 complete less motor; \$89 equipped with motor. Full line of attachments: Universal Tool-Past Grinder, Milling Attachment, etc. 10 days trial. Satisfaction guaranteed. Easy terms. Ask your supply house or write for free catalogue.

**ATLAS PRESS CO.**  
Makers of famous Atlas Arbor Presses  
1846 N. Pitcher St., Kalamazoo, Mich.



### Federal Model 644 Thickness Gage

The illustration shows the Model 644 Thickness Gage which has been brought out by Federal Products Corporation, 1144 Eddy St., Providence, R. I., for use in gauging the thickness of materials within the limits of the gage. The gage is made with two  $\frac{3}{4}$ -in. diameter aligning surfaces, the upper one of which can be raised by compressing a movable lever in the handle. In the center of the lower surface is the stationary gauging point

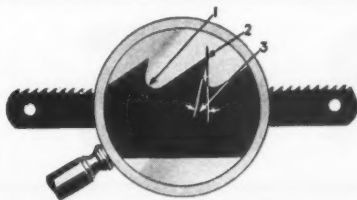


Federal Model 644 Thickness Gage

and in the center of the upper one is the movable gauging point which makes direct contact with the dial indicator.

The feature of the instrument consists in the clamping arrangement. The instrument is so constructed that the material being gauged is solidly clamped before the measuring anvils come in contact with the work, thereby eliminating the questionable equation of the human touch and determining when the material being gauged is in perfect alignment with the gauging points.

The operation of the gage is entirely automatic, which makes the services of an experienced inspector unnecessary. To operate, the lever in the handle is compressed, raising the upper anvil, then the work is placed between the anvils and the lever is released. The material is securely clamped in perfect alignment with the two indicating points and the thickness



### Longer Blade Life with WHALE BRAND



Whale Brand Hack Saw Blades provide longer blade life, faster cutting and less breakage.

The large, round gullet (1), keen, sharp edge (2), and undercut tooth (3) combine to give you the utmost in hack saw blade performance.

*Write for trial blade and let it prove its advantages to you!*

**THE FORSBERG MFG. CO.**  
BRIDGEPORT, CONN.



### TAKE THE GRINDER TO THE JOB

Many jobs can be done quicker and easier with a Portable Grinder.

Ask for a demonstration

**STANLEY  
ELECTRIC TOOL CO.**  
New Britain, Conn.

### CENTERLESS GRINDING

Accuracy — Prompt Service

**COMMERCIAL CENTERLESS  
GRINDING CO.**

6538 CARNEGIE AVE. CLEVELAND

---

# R E S U

---

## A R E W H A T

**M**ODERN MACHINE SHOP is the one publication in the metalworking industry that has an unequalled record for consistently producing results for its advertisers.

The reason is obvious.

MODERN MACHINE SHOP with its hand-picked circulation of 25,000 mechanical executives in more than 20,000 plants IS the most widely read publication in the field . . . the only magazine giving you blanket coverage of your market . . . at an economical cost.

Here is what MODERN MACHINE SHOP advertisers are saying now:

June 16, 1933

"For the past several months a good volume of inquiries have been coming in as a result of the advertisements appearing in your magazine; therefore, we have decided to increase our space to half pages per issue."

PERKINS MACHINE & GEAR CO.

---

# MODERN MACHINE SHOP

---

---

# U L T S !

---

## T COUNT TODAY

---

June 27, 1933.

"We have received to date approximately fifteen inquiries on our pulleys, and in view of the short time since the advertisement came out, we are gratified with the results and are confident we will receive more within the next week or ten days."

ADRIAN FOUNDRY & MACHINE CO.

July 19, 1933.

"Enclosed is copy for our advertisement to appear in the August issue of MODERN MACHINE SHOP.

"We are exceedingly pleased with the volume of inquiries which our advertisements in your publication are producing."

TOMKINS-JOHNSON CO.

July 25, 1933.

"In our schedule for 1933 we included MODERN MACHINE SHOP and the results so far obtained this year have fully justified our decision."

ILLINOIS TESTING LABORATORIES, Inc.

These comments show conclusively that MODERN MACHINE SHOP is producing a good volume of inquiries right now! Don't wait. Start your sales messages in this magazine in the September issue. Forms close Aug. 26. Send copy to us today.

---

# P CINCINNATI, OHIO

---

of the material is immediately shown on the dial indicator. The projecting triangular shoe under the lower anvil is simply a guide to facilitate the locating of the material between the anvils.

The dial is equipped with two tolerance hands which can be set for any desired limit, eliminating the necessity of carefully reading the position of the hand on the indicator each time.

### Sheldon 11-in. Engine Lathe

The illustration shows an 11-in. lathe which is now being offered by the Sheldon Machine Co., 3253 Cottage Grove Ave., Chicago, Ill. The lathe is made in two styles, Style "G" and Style "GW", which are the same with the exception of the apron. In the Style G lathes, movement of the carriage for both turning and thread cutting is obtained by engaging half-nuts on the lead screw. Style GW lathes are provided with worm feed and power cross feed in the carriage. The worm feed transmits the power through gearing to the rack pinion for longitudinal travel for turning. The screw is used only for thread cutting. Either style can be supplied, with cone for belt drive or equipped with motor and attachment for making the drive self-contained, and either with floor legs or short legs for bench use.

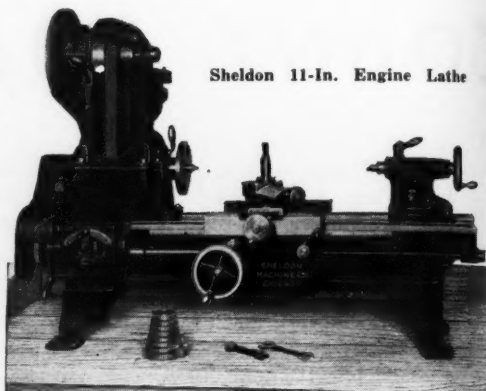
The bed is of semi-steel, heavily reinforced. The headstock is of the full-webbed, bowl type, designed so that all gears are covered. The spindle, which is made from 50 carbon crucible steel, is exceptionally large, is accurately ground all over, and has a  $1\frac{1}{4}$ -in. hole its entire length.

A semi-quick change gear box is regu-

larly furnished on this lathe. It provides three instantaneous changes of feed—fine, medium, and coarse, which can be made while the machine is running. The tailstock has a long bearing on the bed, and can be set over for taper turning.

The swivel slide on the compound rest is graduated 90 deg. each side of center, and both top slide and cross feed screws are equipped with graduated micrometer

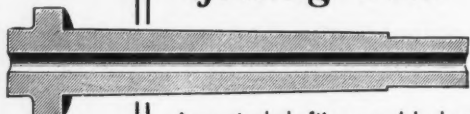
Sheldon 11-In. Engine Lathe



balls. The carriage heavily reinforced for rigidity, and is jig-drilled and tapped to receive the taper attachment, thread chasing dial, chasing stop, and follower rest at any time.

For motor drive, the motor is mounted on a bracket that is mounted directly on the top of the headstock in place of the gear guards. By means of a cam lever, the countershaft bracket is quickly adjusted for shifting or tightening the drive belt. The motor is connected to the adjustable countershaft by means of a V-belt. The starting switch is conveniently located.

## Getting Your Money's Worth



"Bored  
Straight  
and True  
to Size"

... that's what YOU must do today. And when you buy and use American hollow bored forgings, steel shaftings, and hydraulic cylinders you are sure of utmost value and long, dependable service. Write for details and prices.

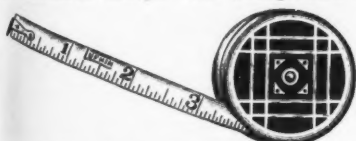
**American Hollow Boring Co.**

2000 Raspberry St.  
Erie, Pennsylvania

The swing over the bed is  $11\frac{1}{4}$  in. and over the carriage bridge is 7 in. Centers are Morse taper No. 2. Threads from 4 to 32 per inch can be cut. Countershaft speed is 340 r.p.m. and the speed of the spindle is from 40 to 600 r.p.m. Width of drive belt,  $1\frac{1}{4}$  in. Bed lengths,  $3\frac{1}{2}$  and  $4\frac{1}{2}$  feet. Motor recommended,  $\frac{1}{2}$  h.p., 1725 r.p.m.

### Lufkin "Aristocrat" Tape-Rule

The illustration shows the "Aristocrat" No. 186 Tape-Rule, which has been added to the line of measuring instruments made by The Lufkin Rule Co., Saginaw, Michigan. The rule consists of a 6-ft. steel tape, contained in a case that is but  $1\frac{1}{8}$  in. in diameter and made of stainless steel. The rule complete weighs but 2 oz. Both sides of the case have an embossed design with background in



Lufkin "Aristocrat" Tape-Rule.

black enamel, giving the rule the appearance its name implies.

The steel tape-line is stiffened by special forming so that it can be projected unsupported, like a rule, yet it will also flex around circular objects and will accurately measure arcs, circles, and so on. A hook at the first end aids in holding the rule while measurements are being taken, and can be hooked over edges which are beyond the user's reach.

The No. 186 rule is graduated in sixteenths to 72 inches. The No. 186D carries, in addition, engineers' measurement; i.e., feet, tenths, and hundredths of feet. Each rule is packed in an attractive black and silver box.



Standardized Die Sets, embodying many exclusive features, and a listing of more than 95,000 stock sizes, afford a service that is unsurpassed.

Send For Our New 208 Page Catalog

**E. A. Baumbach Mfg. Co.**

1806 S. Kilbourn Ave., Chicago, Ill.

### Arbor Spacers

One dollar invested in Arbor Spacers will save \$\$\$ in time and trouble. 360 sizes from  $\frac{1}{8}$ " x  $\frac{1}{8}$ " x .001 through .125 up to 4" x  $5\frac{1}{2}$ ", or any thickness.



List FREE

**DETROIT STAMPING Co.**

3445 W. Fort St.

Detroit, Mich.



Manual

### **SPEED** **SPOT WELDERS**

Over 20,000 In Use

Made foot-operated and automatic motor drive. For welding from .0005 in. to  $\frac{5}{8}$  in. combined thickness.

Welders for fine work priced as low as .....

**\$55.00**

SUBMIT YOUR PROBLEMS

### **EISLER ELECTRIC**

761 South 13th Street

NEWARK, NEW JERSEY

Distributor and Dealer Connections Desired



Automatic

$\frac{1}{2}$  to 75  
K. V. A.



**BALL THRUST BEARINGS  
ROLLER THRUST BEARINGS  
JOURNAL ROLLER BEARINGS**

Special Bearings Made to Order.  
Send Sketch or Sample for Quotation.  
*Catalog Upon Request*  
**THE GWILLIAM CO.**  
358 Furman St. Brooklyn, N. Y.

**Grinding Wheel Dressers**

We Make  
all types  
of  
Dressers  
and  
Cutters



Write  
for  
Catalog  
"M"

**DESMOND-STEPHAN MFG. CO.**  
URBANA, OHIO

**MECHANICAL DEVICES**  
of every description — completely  
assembled or

**STAMPINGS**

Quantity  
Production  
or  
Sample  
Runs

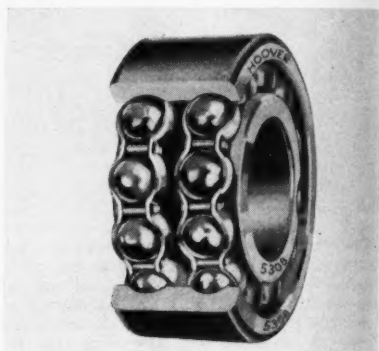


**GERDING BROS.**  
Mechanical Productionists  
5 E. Third St. Cincinnati, Ohio

### Hoover Double Row Ball Bearings

The Hoover Steel Ball Company, Ann Arbor, Michigan, announces the production of Double Row Annular Ball Bearings, being made according to S.A.E. standards in the light, medium, and heavy series, identified as the No. 5200, No. 5300, and No. 5400 series. These bearings are of the deep groove type, having no filling slots or interruptions of raceways, which makes possible a large thrust capacity in either direction in addition to the radial capacity.

The bearings are so made that each raceway in both the inner and outer rings are within minute limits of accuracy and of exactly the same characteristics, insuring each row of balls carrying



Hoover Double Row Ball Bearings

its share of the total load, both from the standpoint of radial and thrust loads.

Formed steel retainers of the riveted type are used for spacing the balls, and the bearings in its entirety is produced from electric furnace high carbon chrome alloy steel, according to S.A.E. analysis No. 52100. These Double Row Bearings are an addition to the Hoover line of Single Row Annular Ball Bearings and Hoover Tapered Roller Bearings.

### Multi-Position Controller Type 305

Controlling the temperature of an industrial process where the heat requirement is fairly constant and the temperature variations are small in amount and in duration, is a problem which can be readily solved with comparatively simple control equipment. However, where the

heat d  
tions o  
often p

A cas  
type, h  
line of  
in rate  
to inter  
duction  
practical  
the cor  
selected  
close li  
during  
the tem  
ring wh  
turrupth  
and wh  
less sud  
tion of  
load tak

Under  
as above  
tion con  
ously re  
ever, th  
types of  
tion con  
signed o  
ciple the  
variation  
tempera  
tion is a  
rect, for  
nace loa  
tion is  
perature

To pro  
more co  
Tempera  
Pa., has  
305 Cont  
strument  
two eith  
the equi  
through



OLIV  
1430 E.



heat demand is subject to wide variations over varying periods, the problem often presents major difficulties.

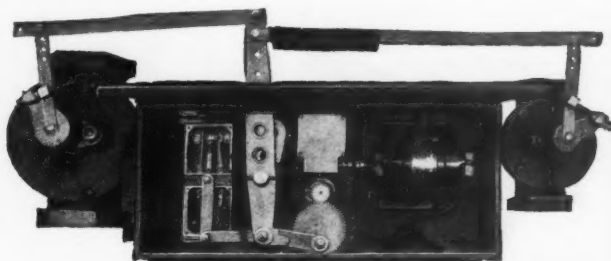
A case in point would be a continuous type, heat treating furnace located in the line of production and subject to changes in rate of flow of the work treated. Due to interruptions somewhere in the production line, such a furnace may run practically empty for short periods and the control mechanism while primarily selected to maintain the furnace within close limits of the temperature setting during periods of normal operation, should likewise hold the temperature setting when these interruptions occur and when more or less sudden resumption of the furnace load takes place.

Under conditions as above, multi-position control is obviously required; however, the general types of multi-position control are designed on the principle that for a given variation from the temperature setting, a given valve position is assumed. This principle is incorrect, for it is evident that when the furnace load changes, a different valve position is required to maintain the temperature at the set point.

To provide a controller designed on a more correct principle, the Automatic Temperature Control Co., Philadelphia, Pa., has developed a unit known as Type 305 Controller, to be actuated by an instrument having five separate contacts—two either side of the normal setting, or the equivalent, which can be obtained through the use of available relays.

Through a simple, positive limit switch arrangement, each intermediate contact between extreme low and extreme high contact in the actuating instrument has two definite valve positions so that on making one of these contacts, following a drop in temperature, the valve opening and hence the resultant fuel supply is greater than when the same contact is made following a rise in temperature. With this control system, it is possible to assure a fuel supply more consistent with the fuel demand.

Type 305 Controller is practically inde-



Type 305 Multi-Position Controller

pendent of time lag conditions and is therefore able to make the necessary adjustments to keep a furnace within narrow limits of the control setting under changing conditions of time lag. With this controller, it is possible to get close control without "hunting", when the valves are set for a much wider operating range than is practical with other multi-position controllers. It thus fills a gap between the conventional two or three position controllers and the complete balancing controller built by the same company.

**ANNOUNCING**  
The Improved **OLIVER**  
**DIE MAKING MACHINE**  
With Many  
New Features



Send for our new  
bulletin and learn  
how to cut die  
costs 30% to 60%.

**OLIVER INSTRUMENT CO.**  
1430 E. Maumee Street, Adrian, Michigan



**"Alnor"**  
MODEL 223  
**PYROMETER**

For the Hardening Furnace

Price complete with-  
out protection  
tube. **\$35**

Write for information

**ILLINOIS TESTING LABORATORIES, Inc.**  
146 W. Austin Ave. CHICAGO, ILL.

## Forsberg "Super-Grip" Screw Driver

The "Super-Grip" line of tools made by the Forsberg Manufacturing Co., Bridgeport, Conn., has been augmented by the addition of a screw driver designed and constructed so that the handle cannot turn or loosen. The handle is of clear maple wood, lacquered in the natural color with deep machine-cut grooves in the handle as shown in the illustration.

The method of fastening the blade into the handle not only prevents the blade from turning or loosening, but also pre-

mits the elimination of the pin, thus making it possible to harden the blade for practically its entire length. Made

## The Mummert-Dixon Spot Facer



... enables you to machine accurate and smooth surfaces on small bosses, etc., in less time than by any other method. Better investigate! Send for a bulletin.

**MUMMERT-DIXON CO.** 120 Philadelphia St.  
HANOVER, PA.

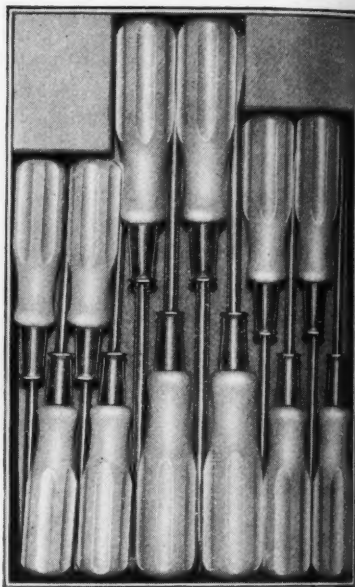
## FACTS

Definite results from advertising messages are extremely important today!

MODERN MACHINE SHOP enjoys an unequalled record for producing results.

With a circulation of more than 25,000, MODERN MACHINE SHOP offers the most thorough coverage of the mechanical executives in the metalworking field.

**MODERN MACHINE SHOP**



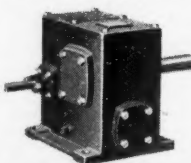
**SUPER-GRIP** NO. 8-456  
MECHANICAL TYPE  
WOOD HANDLE SCREW DRIVERS  
CONTENTS 8 EACH 4" - 5" - 6"  
MANUFACTURED BY  
THE FORSBERG MANUFACTURING CO.  
BRIDGEPORT, CONN., U. S. A.

**Forsberg "Super-Grip" Screw Drivers**

of high carbon steel, the blade is of high quality and will withstand hard usage.

The screw driver is made in 3-in., 4-in., 5-in., 6-in. and 8-in. sizes, both of

## Ohio Speed Reducers



Made in 4 sizes. Complete ball and Timken bearing equipped. Hardened and ground worms. Bronze worm gears. Absolutely oil tight. Unequalled values NOW!

Write for prices and catalog.

**THE OHIO GEAR CO.**

1337 E. 179th St., Cleveland, Ohio

the machinist's type with the blade part through or entirely though the handle, as desired. The electric-type screw driver is made in  $4\frac{1}{2}$ ,  $6\frac{1}{2}$  and  $8\frac{1}{2}$ -in. sizes. The illustration shows an assortment of the screw drivers in a display stand.

### Lufkin All-Stainless Tape-Rule

As a companion to its popular "Crescent" Tape-Rule No. 696, The Lufkin Rule Company, Saginaw, Michigan, has



Lufkin All-Stainless Tape-Rule.

brought out the "All-Stainless Crescent" No. S-696. In this new flexible-rigid 6-ft. tape-rule, genuine stainless steel is used

not only for the graduated tape-line and its sliding hook, but also for the case. This makes the entire rule rust-proof and non-corrosive, adapting it for use in damp places or around acid fumes where rusting is hard to prevent.

The S-696 rule is graduated in inches to sixteenths, for general use. The S-696-D, which is intended for engineers' use, is graduated on the upper edge in feet, tenths, and hundredths of feet, and on the lower edge in feet, inches, and sixteenths.

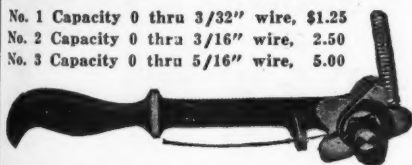
### Norma Hoffmann "Pigmy" Precision Ball Bearings

The Norma-Hoffmann Bearings Corporation, Stamford, Conn., is now including in its standard line of bearings two bearings that are of special interest because of their diminutive size. These bearings are the "N-463" and the "4666". The N-463 bearing has an outside diameter of  $\frac{3}{8}$  in., and a  $\frac{1}{8}$ -in. bore. The 4666 is  $\frac{1}{4}$  in. in diameter in the bore and  $\frac{1}{2}$  in. outside diameter.

Despite their small dimensions, these are true "precision" units, containing, respectively, 12 and 17 balls of  $\frac{1}{16}$ -in.

## HERE'S A REAL SPRING WINDER!

- No. 1 Capacity 0 thru  $3/32$ " wire, \$1.25
- No. 2 Capacity 0 thru  $3/16$ " wire, 2.50
- No. 3 Capacity 0 thru  $5/16$ " wire, 5.00



### Will Earn Its Cost in One Day

The HJORTH Perfection Spring Winder offers the ideal means of winding extension, compression, torsion, taper, double taper, or left hand springs. Try one in your shop. You'll like it and the price is reasonable.

**HJORTH LATHE & TOOL CO.** 60 STATE ST. BOSTON, MASS.

## "ECONOMY"

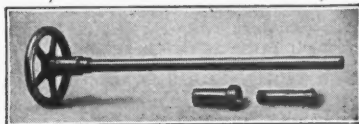
### FACE MILLING CUTTER



Complete with  
High Speed Steel Tool Bits  
 $3/4$ " Facing Dia. No. 7  
or No. 9 Arbor.

WRITE FOR PRICE  
ON LARGER SIZES

MFG. BY J. E. FREYMAN & SONS  
3627-33 KESWICK ROAD, BALTIMORE, MD.



### Collet Attachments for your lathes and millers

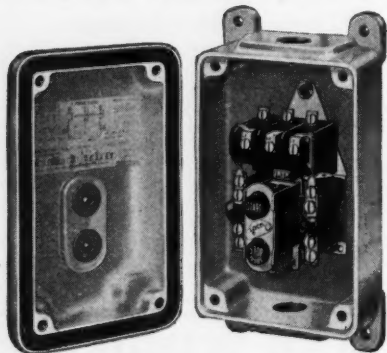
Write for Bulletin No. 100 A. M. —  
Rivett Draw-In Collets and Chucks.  
Also Price List and Dimension Sheet.

**Rivett Lathe & Grinder Corp.**  
Brighton Dist., Boston, Mass., U. S. A.

diameter with inner and outer rings finely ground and finished. These tiny bearings are used extensively, both for rotating and for oscillating loads, in precision instruments, scales, relays, and similar light applications where the utmost accuracy and sensitiveness are essential.

### Allen-Bradley Hand-Operated Starter in Splash Proof Cabinet

An addition to the standard line of Allen-Bradley starters has been made by the Allen-Bradley Company, 1315 S. First



Allen-Bradley Hand-Operated Starter in Splash-Proof Cabinet

St., Milwaukee, Wis., in the form of a splash proof, hand-operated starter for motors up to 3 h. p. 110 volts, 5 h. p. 220 volts, and 7½ h. p. 440-550 volts.

The operating mechanism is identical to the standard "Bulletin 609" hand-operated starter, in which start and stop buttons operate the mechanism without a magnetic coil. Overload breakers disconnect the starter after sustained overload.

The cadmium-plated cabinets are provided with rubber cover gaskets. Splash-proof push buttons in the cabinet cover actuate the switch and exclude moisture from the switch mechanism.

### "Electric Arc Welding"

"Electric Arc Welding" is the title of an 80-page book that is being published by The Hobart Brothers Mfg. Co., Troy, Ohio, for the purpose of presenting such facts about the electric arc welding process as are essential to its application to practical work.

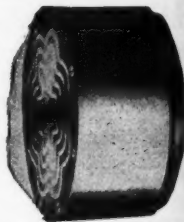
The book is valuable to trained engineers or others who may be interested in the arc welding process, but it is written in such manner that it may be clearly understood by the vast army of men with little or no technical training, who are interested only in practical accomplishments in a wide range of industries. A special effort has been made to avoid highly technical and theoretical discussion and to confine the work to a manual of brief, logical, non-technical, and useful information, derived from a vast amount of practical experience.

In the order indicated, the following subjects are discussed: The Welding Arc; Welding Equipment; Types of Joints and Welds; Weldability of Metals; Choice of Electrodes; Using the Metallic Arc; Using the Carbon Arc; Operating Instructions for Hobart "Constant Arc" Welders; Speed and Cost of Arc Welding.

The book is profusely illustrated with drawings and photographs showing the various steps in the making of welds, results of good and bad practice methods in use on different kinds of welding, and so on.

A copy of this book will be sent without charge to any plant owner or operating executive who will address his request on his firm letter-head.

## Standardize ON D & W Chucks



STANDARDIZATION pays, particularly when the tool is as far ahead of its class as the D & W chuck. Oil and waterproof, it is designed and constructed to give maximum holding surface with exceptionally strong and uniform pull throughout. Cables are protected by rubber tubing — special demagnetizing switches for readily releasing the work.



Complete  
information  
on request.

**J. & H. ELECTRIC  
COMPANY**

202 Richmond St.  
PROVIDENCE, R. I.

## Milford "Rezistor" Hack Saw Blade Bulletin

Figures showing the results of tests made with Milford "Rezistor" Hack Saw blades are given in a bulletin that can be had by addressing The Henry G. Thompson & Son Co., New Haven, Conn. The test data show the sizes of the saws tested, material cut during the tests, and the speed at which the blades were operated. A table of specifications of "Rezistor" blades is included. Users of hack saw blades may obtain a copy of the bulletin by addressing the firm as above.

## "Floors That Cut Profits"

"In shops, mills, plants, warehouses and terminals where interplant transportation is handled by industrial hand and power trucks, floors and runways are subject to much expensive breaking and cracking unless the trucks are wheeled on rubber tires," declares a folder "Floors That Cut Profits," issued by The B. F. Goodrich Company, Akron, Ohio.

"In most plants industrial tires represent an item of minor importance so far as purchasing is concerned, but these same purchases can effect remarkable savings in floor costs" the booklet continues. "In addition to floor protection, industrial tires reduce breakage and promote more efficient handling of materials."

Reports of recent tests between Goodrich Roller type industrial tires and steel wheels also are given in the folder. In these tests a steel wheel and one equipped with rubber tires were run over two identical discs of standard mix concrete, the load on each wheel being 383 pounds. The steel wheel broke down the concrete badly at both the expansion joint and standard section joint in 3622 revolutions made in 44 minutes. The rubber tired wheel had made no effect on the

concrete at the end of 231,650 revolutions, in 46 hours. Copies of the folder are available upon request to Goodrich Company at the above address.

## Biax Tapper Bulletin

The Charles L. Jarvis Co., Gildersleeve, Conn., has issued a bulletin carrying a cross-section drawing of the Biax No. 0 and No. 1 Tapper, with sufficient descriptive matter to explain the design of the tool. The exclusive Jarvis features are enumerated so that the reader will be able to instantly grasp the advantages of the design of this tool. Copies free.

## A NEW SWISS JIG BORER

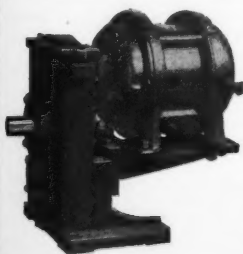


It is easy to produce small jigs, tools, and production pieces with this machine.

Ask for pamphlet 560. It tells all about this new MP-2C machine.

## THE R.Y. FERNER COMPANY

1133 Investment Bldg., Wash., D. C.



## CULLMAN SPEED REDUCERS

FOR

Motors From  $\frac{1}{8}$  to 15 H. P.

NEW CATALOGUES ARE READY  
SEND FOR YOUR COPY

## Cullman Wheel Company

1336 ALTGELD ST., CHICAGO, ILL.

## Check For Information Wanted

If you are interested in prices or information on any of the equipment listed, check the item, write your name, firm name, title and address on the margin, tear out the page and send it to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. We will see that you are supplied with the information desired.

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Abrasive Discs            | <input type="checkbox"/> Drilling Machines, Sensitive | <input type="checkbox"/> Parallels                   |
| <input type="checkbox"/> Abrasive Polishing Grains | <input type="checkbox"/> Drilling Machine Heads       | <input type="checkbox"/> Pipe-Cut'g & Thr'd'g Mach'y |
| <input type="checkbox"/> Arbors                    | <input type="checkbox"/> Drilling Mach., Automatic    | <input type="checkbox"/> Pipe Tools                  |
| <input type="checkbox"/> Babbitt Metal             | <input type="checkbox"/> Drilling Machines, Gang      | <input type="checkbox"/> Planers                     |
| <input type="checkbox"/> Balancing Machines        | <input type="checkbox"/> Drilling Mach., Heavy Duty   | <input type="checkbox"/> Polishing & Buffing Machs.  |
| <input type="checkbox"/> Balancing Ways            | <input type="checkbox"/> Drilling Machines, Multiple  | <input type="checkbox"/> Presses, Arbor              |
| <input type="checkbox"/> Bearings, Ball or Roller  | <input type="checkbox"/> Drilling Machines, Radial    | <input type="checkbox"/> Presses, Punch              |
| <input type="checkbox"/> Bearings, Die-cast        | <input type="checkbox"/> Drills, Center               | <input type="checkbox"/> Pulleys, Metal or Wood      |
| <input type="checkbox"/> Bearings, Bronze & Bab'   | <input type="checkbox"/> Drills, Portable Electric    | <input type="checkbox"/> Pumps, Lubricants or Oil    |
| <input type="checkbox"/> Belting, Leather          | <input type="checkbox"/> Drills, Portable Pneumatic   | <input type="checkbox"/> Punches, Hand               |
| <input type="checkbox"/> Belt Dressing             | <input type="checkbox"/> Drills, Ratchet              | <input type="checkbox"/> Punches, Power              |
| <input type="checkbox"/> Bench Legs                | <input type="checkbox"/> Drills, Twist and Flat       | <input type="checkbox"/> Punch Holders               |
| <input type="checkbox"/> Benches                   | <input type="checkbox"/> Files and Rasps              | <input type="checkbox"/> Racks, Cut                  |
| <input type="checkbox"/> Bending Machines          | <input type="checkbox"/> Filing Machines              | <input type="checkbox"/> Reamer Holders              |
| <input type="checkbox"/> Blue Printing Machinery   | <input type="checkbox"/> Forging Machinery            | <input type="checkbox"/> Reamers, Adjustable         |
| <input type="checkbox"/> Bolt and Nut Machinery    | <input type="checkbox"/> Furnaces, Forging            | <input type="checkbox"/> Reamers, Solid              |
| <input type="checkbox"/> Bolts and Nuts            | <input type="checkbox"/> Furnaces, Heat Treating      | <input type="checkbox"/> Riveting Machines           |
| <input type="checkbox"/> Bolts, Stripper           | <input type="checkbox"/> Furniture, Machine Shop      | <input type="checkbox"/> Rules, Steel and Wood       |
| <input type="checkbox"/> Boring Bars               | <input type="checkbox"/> Gauge Blocks                 | <input type="checkbox"/> Rust Preventatives          |
| <input type="checkbox"/> Boring Mills, Vertical    | <input type="checkbox"/> Gauges, Dial                 | <input type="checkbox"/> Saws, Metal                 |
| <input type="checkbox"/> Boring Mills, Horizontal  | <input type="checkbox"/> Gauges, Plug and Ring        | <input type="checkbox"/> Saw Frames and Blades       |
| <input type="checkbox"/> Boring Heads              | <input type="checkbox"/> Gauges, Snap                 | <input type="checkbox"/> Sawing Machines, Power      |
| <input type="checkbox"/> Boring Tools              | <input type="checkbox"/> Gauges, Thread               | <input type="checkbox"/> Saws, Band                  |
| <input type="checkbox"/> Broaches                  | <input type="checkbox"/> Gear Blanks, Composition     | <input type="checkbox"/> Saws, Milling               |
| <input type="checkbox"/> Broaching Machines        | <input type="checkbox"/> Gear-Cutting Machinery       | <input type="checkbox"/> Scales, Machinists'         |
| <input type="checkbox"/> Bushings, Jig             | <input type="checkbox"/> Gears, Cast or Cut           | <input type="checkbox"/> Screw Machines, Automatic   |
| <input type="checkbox"/> Bushings, Bearing         | <input type="checkbox"/> Grinding Mach., Cylindrical  | <input type="checkbox"/> Screw Machines, Hand        |
| <input type="checkbox"/> Cabinets, Steel, Shop     | <input type="checkbox"/> Grinding Machines, Univ.     | <input type="checkbox"/> Screws, Cap, Set or Mach.   |
| <input type="checkbox"/> Calipers                  | <input type="checkbox"/> Grinding Machines, Cutter    | <input type="checkbox"/> Screws, Hardened Drive      |
| <input type="checkbox"/> Centering Machines        | <input type="checkbox"/> Grinding Machines, Drill     | <input type="checkbox"/> Screws, Self-Tapping        |
| <input type="checkbox"/> Centers, Lathe            | <input type="checkbox"/> Grinding Machines, Internal  | <input type="checkbox"/> Shafting                    |
| <input type="checkbox"/> Chains, Sprocket          | <input type="checkbox"/> Grinding Machines, Portable  | <input type="checkbox"/> Shafts, Flexible            |
| <input type="checkbox"/> Chamfering Machines       | <input type="checkbox"/> Grinding Machines, Surface   | <input type="checkbox"/> Shapers                     |
| <input type="checkbox"/> Chucking Machines         | <input type="checkbox"/> Grinding Wheels              | <input type="checkbox"/> Shears, Hand or Power       |
| <input type="checkbox"/> Chucks, Air-Operated      | <input type="checkbox"/> Grinding Wheel Stands        | <input type="checkbox"/> Sleeves, Drill              |
| <input type="checkbox"/> Chucks, Quick-Changing    | <input type="checkbox"/> Hammers, Pneumatic           | <input type="checkbox"/> Springs, Pressure Pad       |
| <input type="checkbox"/> Chucks, Collet            | <input type="checkbox"/> Hobbing Machines             | <input type="checkbox"/> Squares                     |
| <input type="checkbox"/> Chucks, Drill and Tap     | <input type="checkbox"/> Hobs, Gear                   | <input type="checkbox"/> Stamps, Steel               |
| <input type="checkbox"/> Chucks, Lathe and Planer  | <input type="checkbox"/> Hoists, Chain or Electric    | <input type="checkbox"/> Stands, Shop, Portable      |
| <input type="checkbox"/> Clamps, Machinists'       | <input type="checkbox"/> Indicators, Speed or Test    | <input type="checkbox"/> Tap Holders                 |
| <input type="checkbox"/> Clutches, Friction        | <input type="checkbox"/> Jacks, Planer                | <input type="checkbox"/> Tapes, Measuring            |
| <input type="checkbox"/> Collars, Spacing          | <input type="checkbox"/> Keyseating Machinery         | <input type="checkbox"/> Tapping Machines            |
| <input type="checkbox"/> Compounds, Carbonizing    | <input type="checkbox"/> Lapping Machines             | <input type="checkbox"/> Tapping Attachments         |
| <input type="checkbox"/> Compounds, Cutting        | <input type="checkbox"/> Lathes, Engine               | <input type="checkbox"/> Taps and Dies               |
| <input type="checkbox"/> Compressors, Air and Gas  | <input type="checkbox"/> Lathes, Turret               | <input type="checkbox"/> Taps, Collapsible           |
| <input type="checkbox"/> Contract Work             | <input type="checkbox"/> Lathes, Automatic            | <input type="checkbox"/> Testing Mach'y, Hardness    |
| <input type="checkbox"/> Counterbores              | <input type="checkbox"/> Lathes, Bench                | <input type="checkbox"/> Thread-Cutting Tools        |
| <input type="checkbox"/> Countersinks              | <input type="checkbox"/> Lathes, Gap                  | <input type="checkbox"/> Threading Machines          |
| <input type="checkbox"/> Couplings, Flexible       | <input type="checkbox"/> Lathes, Polishing            | <input type="checkbox"/> Thread Mill. & Roll. Mach'y |
| <input type="checkbox"/> Cutters, Gear             | <input type="checkbox"/> Lathe Dogs                   | <input type="checkbox"/> Tool Bits                   |
| <input type="checkbox"/> Cutters, Keyseating       | <input type="checkbox"/> Lubricants                   | <input type="checkbox"/> Tool Cases                  |
| <input type="checkbox"/> Cutters, Milling          | <input type="checkbox"/> Mandrels, Expanding          | <input type="checkbox"/> Tool Holders                |
| <input type="checkbox"/> Cutting-Off Machines      | <input type="checkbox"/> Mandrels, Solid              | <input type="checkbox"/> Tool Posts, Lathe           |
| <input type="checkbox"/> Cutting-Off Tools         | <input type="checkbox"/> Micrometers                  | <input type="checkbox"/> Trolleys and Tramways       |
| <input type="checkbox"/> Dies, Self-Opening        | <input type="checkbox"/> Milling Machines, Automatic  | <input type="checkbox"/> Trucks, Hand, Lift, Power   |
| <input type="checkbox"/> Dies, Threading           | <input type="checkbox"/> Milling Machines, Bench      | <input type="checkbox"/> Turrets, Tool Post          |
| <input type="checkbox"/> Die Sets                  | <input type="checkbox"/> Milling Machines, Horizontal | <input type="checkbox"/> Valves, Air Control         |
| <input type="checkbox"/> Die Shoes                 | <input type="checkbox"/> Milling Machines, Vertical   | <input type="checkbox"/> Vises, Bench or Machine     |
| <input type="checkbox"/> Dividing Heads            | <input type="checkbox"/> Milling Attachments          | <input type="checkbox"/> Welding Equip. & Supplies   |
| <input type="checkbox"/> Dogs, Lathe               | <input type="checkbox"/> Milling Tools                | <input type="checkbox"/> Welding Machines, Electric  |
| <input type="checkbox"/> Dowel Pins                | <input type="checkbox"/> Oil-Grooving Machines        | <input type="checkbox"/> Wrenches, Drop-Forged       |
| <input type="checkbox"/> Dressers, Grinding Wheel  | <input type="checkbox"/> Oil Stones                   | <input type="checkbox"/> Wrenches, Pipe              |
| <input type="checkbox"/> Drill Holders             | <input type="checkbox"/> Oils                         | <input type="checkbox"/> Wrenches, Ratchet           |
| <input type="checkbox"/> Drilling Machines, Bench  | <input type="checkbox"/> Ovens, Industrial            | <input type="checkbox"/> Wrenches, Tap               |





When In Boston

## Hotel Kenmore

COMMONWEALTH AVE. AT KENMORE  
SQUARE

**400 Rooms** from **\$3<sup>00</sup>**  
Daily

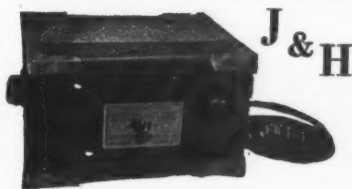
... with tub—shower and  
circulating ice water

*Ample Parking Space*

## FACTS

MODERN MACHINE  
SHOP fits into the  
coat pocket. This con-  
venience is appreci-  
ated by MODERN  
MACHINE SHOP  
readers . . . it lets the  
issue "go along".

**MODERN MACHINE SHOP**



## The Demagnetizer For Alternating Current

THE J & H Demagnetizer requires no  
countershafts, belts, or other intricate  
electrical connections. All that is neces-  
sary is to plug it into the nearest lamp  
socket or receptacle.

It is of the new Unipole type—heavy  
duty—and can be supplied for either 110  
or 220 volt alternating current. Size  
12" long, 9" deep, 6" high. Weight  
60 lbs.

*Sold On One Week's Trial!*

**J. & H. Electric Co.**

202 RICHMOND STREET,  
PROVIDENCE, R. I.



Feature Unusually Comfortable Rooms,  
the Finest of Foods, and

Rates Starting at \$2.50 Single,  
\$3.50 Double

In CLEVELAND It's  
**THE HOLLENDEN**

1,050 Rooms, all with Bath

In CHICAGO It's  
**THE LA SALLE**

In COLUMBUS It's  
**THE NEIL HOUSE**

650 Rooms, all with Bath

In AKRON It's  
**THE MAYFLOWER**

450 Rooms, all with Bath

## For Your Catalog Library

Check any of these useful publications that you want, write your name, firm name, title, and address on the margin, then tear out the page and send to Modern Machine Shop, 128 Open Place, Cincinnati, Ohio. They will be forwarded to you promptly without cost or obligation. Please restrict your list to not more than five.

**Pulleys** of high grade aluminum alloy, accurately machined, are described and illustrated in a bulletin that can be had by addressing Adrian Foundry & Machine Co. Inc., Adrian, Mich.

**Lubrication by Barrel-To-Bearing System:** The most modern system of lubrication for machine tools is described in a folder that can be had by writing to Alomite Corporation, 2680 N. Crawford Ave., Chicago, Ill.

**Chucks—Key and Keyless:** Bulletin No. 120A, 632, and 633, issued by T. R. Almond Mfg Co., Ashburnham, Mass., describe and illustrate the line of key and keyless geared nut and ball bearing drill chucks made by this firm. Copies free upon request.

**Cut Your Sawing Costs:** "Lenox" hack saw blades and band saws are guaranteed to effect savings on your sawing operations. Write for information to American Saw & Mfg. Co., Springfield, Mass.

**Stop Tap Breakage:** A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine & Tool Co., 200 Davis Avenue, Dayton, Ohio. Sent free upon request.

**Machine Shop Accessories:** Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

**"Atlas" Bench Lathe:** A 9-in. screw cutting, self-contained, motor-driven bench lathe is now being built by Atlas Press Co., Kalamazoo, Mich. Write for circular.

**Irregular contours on dies or tools** can be finished accurately and fast by the use of the No. 2 Baker Grinder. Write Baker Brothers, Inc., Toledo, Ohio, for descriptive bulletin.

**Drop Forged Steel Die Sets:** The economy and other advantages of drop forged steel die sets, which are now being made by E. A. Baumbach Manfg. Co., 1806 South Kilbourn Avenue, Chicago, Ill., are explained in a folder that can be had by addressing this firm.

**Bushings and Bearings:** 500 sizes of finished bronze bushings that are available immediately are shown in a catalog that can be had by writing to The Bunting Brass & Bronze Co., Toledo, O.

**Centerless Grinding:** A high-speed service at low cost. If you have cylindrical parts to be ground, send blue-prints for estimates to Commercial Centerless Grinding Co., 6538 Carnegie Ave., Cleveland, Ohio.

**Boring Tool With Micrometer Adjustment:** A circular describing and illustrating the Faingren Off-Set Boring Tool, which is adaptable for either tool or production work can be had by addressing the Chicago Tool and Engineering Co., 84th St. and So. Chicago Ave., Chicago, Ill.

**Motorize Your Cone Pulley Lathes:** An attachment that can be applied to your lathe with four bolts makes it possible to motorize and modernize your lathes. Write for information to Cullman Wheel Co., 1336 Altgeld St., Chicago, Ill.

**Die Makers' Supplies:** A complete line of die sets, leader pins, bushings, and other die makers' supplies are described in a book that is issued by

the Danly Machine Specialties, Inc., 2104 South 52nd Avenue, Chicago, Ill. Sent free upon request.

**"Hypro" Planers:** The most modern engineering practice is incorporated in the design of Cincinnati "Hypro" Planers, made by the Cincinnati Planer Co., Oakley, Cincinnati, Ohio. Write for catalog.

**Davis Keyseaters:** The newest methods of keyseating are discussed in a bulletin that also describes and illustrates the keyseating machines made by the Davis Keyseater Co., 250 Mill St., Rochester, N. Y. Copy free upon request.

**Steel Spacing Washers:** Milling jobs can be set up quicker by using standard spacing washers made by Detroit Stamping Co., 1345 West Fort Street, Detroit, Michigan. Write for information.

**"Speed" Spot Welders** for welding metals from 0.0005 in. to  $\frac{1}{2}$  in. thick are described in a catalog that can be had by addressing Elster Electric Corp., 761 South 13th Street, Newark, N. J.

**Emerald Motors** are designed for simplicity, ruggedness, and dependability. Three sizes:  $\frac{1}{4}$ ,  $\frac{1}{2}$ , and 1 h. p. Write Emerald Electric Company, Adrian, Michigan, for bulletin.

**Performance Data On Swiss Jig Bore:** This 36-page pamphlet shows various types of jobs from a power shovel turntable jig to a turbine disc, drilled and bored on Societe Genevoise Jig Speed Precision Bore, giving data as to size of holes, accuracy and time savings. Free upon request to The R. Y. Ferner Co., 1008 K Street, N. W., Washington, D. C.

**Secret of Fast Cutting:** Use a hack saw blade with the correct tooth-clearance angle so that the metal will be cut—not pushed. Full information can be had by asking Forsberg Manfg. Co., 125 Scoville Ave., Bridgeport, Conn., for bulletin on "Whale Brand" Hack Saw Blades.

**Formica Silent Composition Gears:** A booklet telling about the uses and advantages of Formica Silent Shock-Absorbing Gears, and containing a fund of valuable data with rules and tables for laying out, cutting, and using gears can be had by addressing Formica Insulation Co., 4632 Surging Grove Ave., Cincinnati, O.

**Tool Grinding Costs** can be cut by using the "Economy" face milling cutter. Write to J. E. Freyman & Sons, 3627 Keswick Road, Baltimore, Md., for information.

**Stampings** of any kind or size can be obtained from Greding Brothers, 5 East Third Street, Cincinnati, Ohio. Write for particulars.

**Ball and Roller Bearings,** either journal or thrust, for all purposes and all sizes, are described and illustrated in a catalog that has been issued by The Williams Company, 360 Furman Street, Brooklyn, N. Y. Copy free upon request.

**Precision Bench Lathe Work** can only be done on finely-built, accurate machines. The complete line of Hirth Precision Bench Lathes is described and illustrated in a catalog that has been issued by Hirth Lathe & Tool Company, 60 State Street, Boston, Mass. Copy free upon request.

**Pyrometers:** Inexpensive portable and stationary, single unit and multi-circuit pyrometers are described in a catalog issued by Illinois Testing Laboratories, Inc., 146 West Austin Avenue, Chicago, Ill. Copy free upon request.

**Oil and Waterproof Chucks:** The J & H Electric Co., 202 Richmond Street, Providence, R. I., is now making a chuck that is oil and waterproof, and is designed to provide a maximum of holding surface with exceptionally strong and uniform pull throughout. Ask for complete information.

**Solve Your Tapping Problems** with a Jarvis Tapper. Tapping devices for every type of job. Write The Charles L. Jarvis Co., Gildersleeve, Conn., for information and prices.

**Do you buy the same cutter over and over again?** Every time you grind a cutter on an old-fashioned time-wasting cutter grinding machine, you are paying for new cutters that you never get. Let the Landis Tool Company, Waynesboro, Pa., tell you how to save this money. Write today.

**Threading Machinery:** Complete catalogs of industrial bulletins covering the pipe threading and cutting machines, bolt threading machines, or die made by Landis Machine Co., Waynesboro, Penna., may be had upon request from this firm. Size and type of machine or die head.

**Air-Operated Work-Holding Devices:** A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

**Master Complete Power Drive:** Booklet S-20, published by The Master Electric Company, 104 First Ave., Dayton, Ohio, describes and illustrates the Master Geared-Head Motor in service, with applications to all kinds of drives. Copy free.

**Magic Chucks:** Instantaneous change of tools without stopping the machine spindle can be accomplished by the use of Modern Magic Chucks, made by the Modern Tool Works, Rochester, N. Y. Write for descriptive booklet.

**Compound Spot-Facing Tool:** A spot-facing tool extracting, serrated roughing cutters and fixed finishing cutters in the same tool will break up the scale easily and do accurate work. Write for bulletin to Mummert-Dixon Co., 120 Philadelphia St., Hanover, Penna.

**"The Birth of a Notion"**, published by National Boring Tool Co., 1312 Mt. Elliot Ave., Detroit, Mich., describes the design, construction, and use of a ball bearing rotary jig and pilot bushing. Copy free upon request.

**Ball and Roller Bearing Data Sheets:** A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

**Speed Reducers:** Speed Reducers to obtain any desired reduction up to 24,000 to 1 are described and illustrated in Catalog 29-A, issued by The Ohio Gear Co., 1335 East 179th St., Cleveland, O. Copy free upon request.

**Die Making Machines:** How dies, templates, pages, etc., can be saved out, filed, and lapped easily and accurately on Oliver die making machines, is fully described in a bulletin issued by the Oliver Instrument Company, 1430 Maumee Street, Adrian, Mich. Mailed upon request.

**Good Gears** of all kinds—spur, spiral, bevel, worm, hypoid—in fact any kind or type of gear desired, large or small, machined to an excellent finish and the highest degree of accuracy may be obtained from Perkins Machine & Gear Co., 151 Circuit Ave., Springfield, Mass. Write for estimates.

**Bench Lathe Mounting and Driving Equipment:** Bulletin 120-A, issued by Rivett Lathe and Grinder Corporation, Brighton, Mass., contains complete descriptions and illustrations of modern and conventional countershaft, individual motor drive jack-shaft, and speed box motor drive, also benches, cabinets, oil pans, etc. Copy free upon request.

**Flat Steel Wire to Meet Specifications** of the most exacting buyers is now being made by John A. Roebbling's Sons Company, Trenton, N. J. Send your specifications and ask for prices.

**Foot-Controlled Air-Valve:** Air-operated equipment can now be controlled by valves that are operated by the foot, leaving the hands free to operate the machine. Write for information to the Ross Operating Valve Co., 6488 Epworth Blvd., Detroit, Michigan.

**Simonds Files:** A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

**An Electric Hand Shear** will save time, material, and labor on jobs that are too small, too large, too complicated, or too cumbersome to be handled in the power shear. Ask The Stanley Electric Tool Co., New Britain, Conn., for catalog.

**Cutting and Grinding Facts:** A discussion of cutting oils and lubricants, together with descriptions and illustrations of various kinds of jobs upon which cutting oils are used, is contained in a booklet that is issued by the Sun Oil Company, 1608 Walnut Street, Philadelphia, Penna. Free upon request.

**A Self-Starting Hack Saw Blade:** The Milford Duplex blade is made with fine teeth on the front end, to start the cut on the first stroke. Write The Henry G. Thompson & Son Co., New Haven, Conn.

**Chuck With Air:** How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tompkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

**Protection and Beauty** can be added to the selling points of your product by applying a metal coat of Udylite-Cadmium. Ask Udylite Process Co., 3939 Bellevue Ave., Detroit, Michigan, for complete information as to equipment required, methods, costs, etc.

**Multiple Drilling With a Single-Spindle Drill:** Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati, Ohio.

**Electrically-Driven Portable Tools:** The "U. S." line of electric drills, die grinders, surface grinders, toolpost grinders, and bench and floor grinders is described in Catalog No. 33, published by The United States Electric Tool Co., 2471 West Sixth Street, Cincinnati, Ohio. Copy free.

**"Extra Value" Hack Saw Blades:** Hack saw blades made of an alloy in which molybdenum is used, and which are said to withstand shock and wear to an unusual degree are now being made by Victor Saw Works, Middletown, N. Y. Full particulars will be sent upon request.

**Toolmakers' Tool Chests:** The complete line of fine tool chests for toolmakers and machinists made by J. M. Waterson, 420 Woodward Ave., Detroit, Mich., is described in Catalog No. 25. Write for it.

**Power Drive in Any Position:** The modern flexible shaft makes it possible to drive all kinds and types of tools in places and positions impossible of access with straight-shaft machines. Ask The S. S. White Dental Mfg. Co., Industrial Division, 150A West 42nd Street, New York, N. Y., for the "Flexible Shaft Handbook." Copy free to any mechanical executive addressing this firm on his firm letterhead.

# Index to Advertisements

A	Page	K	Page
Adrian Foundry & Machine Co.....	*	Kenmore Hotel .....	6
Alemite Corporation .....	6		
Almond Mfg. Co., T. R. ....	1		
American Hollow Boring Co.....	52	L	
American Saw & Mfg. Co.....	*	Landis Machine Co., Inc.....	*
Apex Machine & Tool Co.....	37	Landis Tool Company.....	*
Armstrong Bros. Tool Co.....	*	Logansport Machine Co., The.....	Second Co
Atlas Press Company.....	48		
Auburn Ball Bearing Co.....	*		
		M	
B		Master Electric Co., The.....	First Co
Baker Bros., Inc.....	4	Millholland Sales Co.....	30
Baumbach Mfg. Co., E. A.....	53	Modern Machine Shop.....	50
Bunting Brass & Bronze Co.....	48	Modern Tool Works.....	*
		Mummert-Dixon Company.....	*
C		N	
Cincinnati Planer Co.....	29	National Boring Tool Co.....	46
Commercial Centerless Grinding Co.....	49	Norma-Hoffmann Bearings Corp.....	2
Cullman Wheel Co.....	59	Norton Company .....	32, 3
D		O	
Danly Machine Specialties, Inc.....	43	Ohio Gear Company, The.....	53
Davis Keyseater Company.....	*	Oliver Instrument Co.....	55
Detroit Stamping Company.....	53		
Desmond-Stephan Mfg. Co.....	54		
		P	
E		Perkins Machine & Gear Co.....	39
Eisler Electric Corporation.....	53		
		R	
F		Rivett Lathe & Grinder Corp.....	57
Ferner Co., The R. Y.....	44, 59	Roebling's Sons Co., John A.....	13
Formica Insulation Co., The.....	*		
Forsberg Mfg. Co.....	49	S	
Freyman & Sons, J. E.....	57	Simonds Saw & Steel Co.....	Third Cover
		Stanley Electric Tool Co.....	49
		Sun Oil Company.....	23
G		T	
Gerding Brothers.....	54	Thompson & Son Co., Henry G.....	*
Gwilliam Company, The.....	54	Tomkins-Johnson Co.....	47
H		U	
Hjorth Lathe & Tool Co.....	57	Udylite Process Company.....	3
Hollenden Hotel .....	61	United States Drill Head Co.....	44
		United States Electrical Tool Co., The.....	Fourth Cover
I		V	
Illinois Testing Laboratories, Inc.....	55	Victor Saw Works.....	45
J		W	
J. & H. Electric Co.....	58, 61	Waterston, J. M.....	47
Jarvis Co., The Charles L.....	46	White Dental Mfg. Co., The S. S.....	*

\*Space Scheduled. See next issue.